THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXVI. No. 1699.] LONDON, DECEMBER 3, 1895. [47TH YEAR. PRICE 6d.

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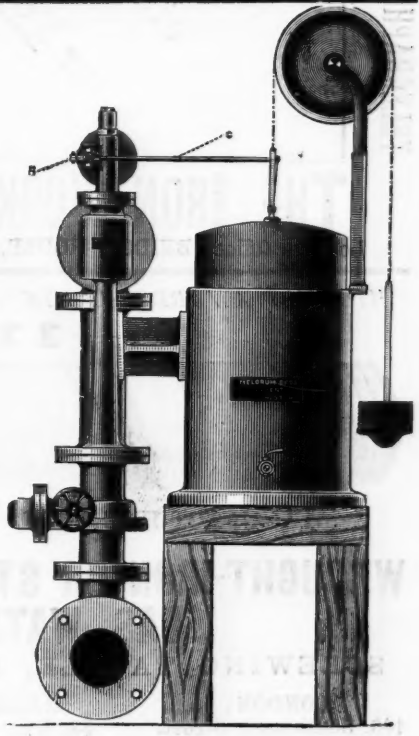

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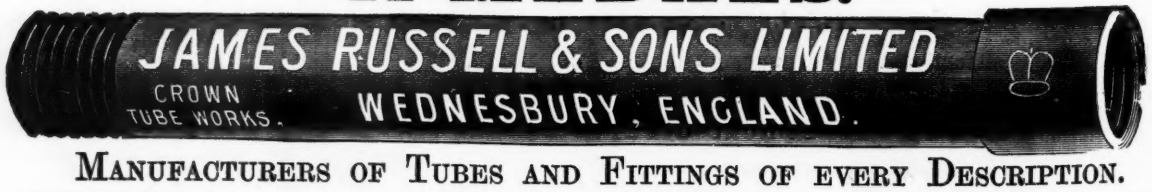

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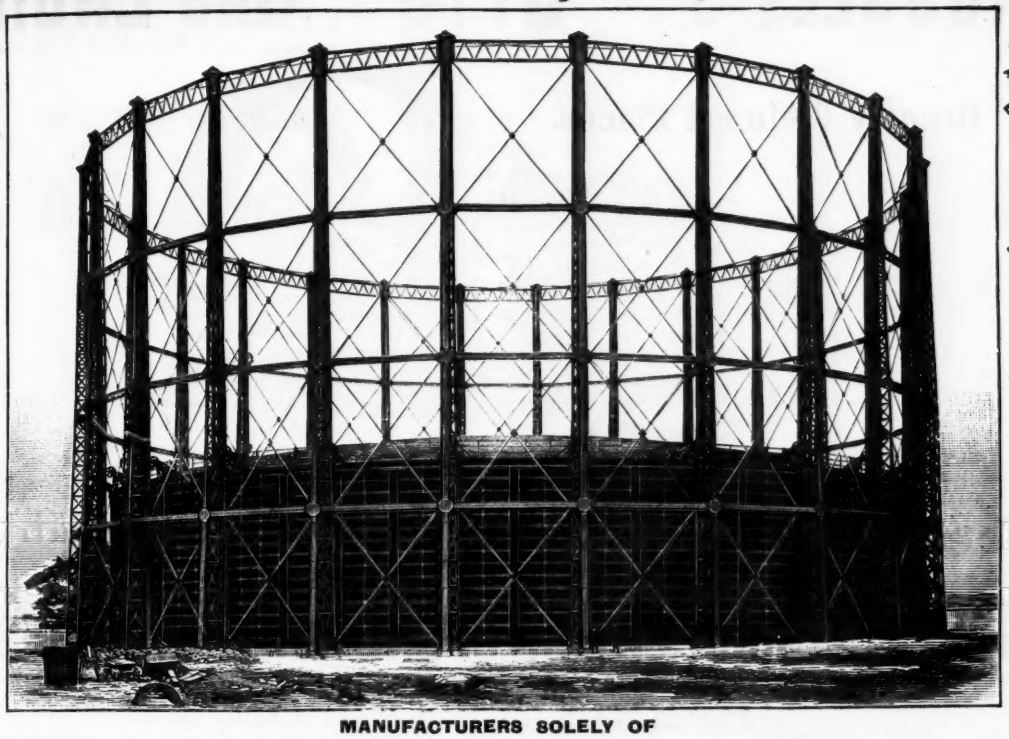

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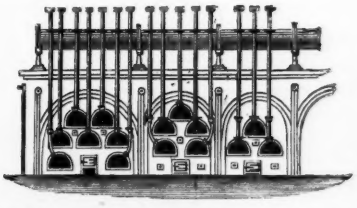

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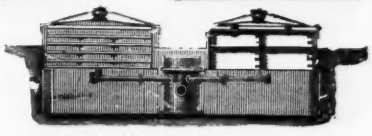

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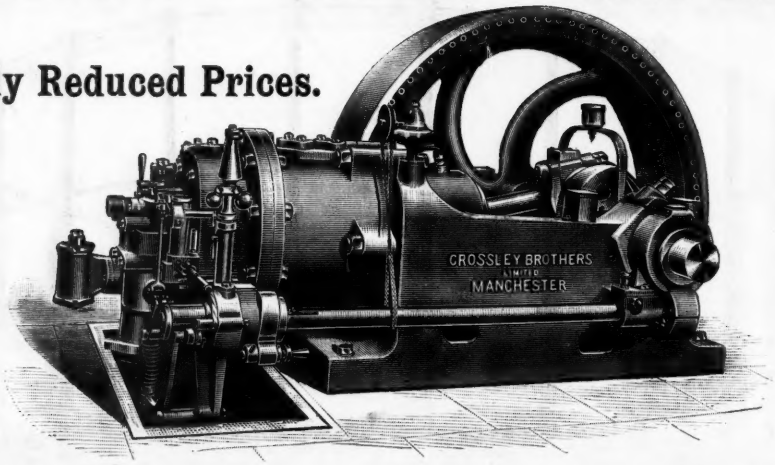

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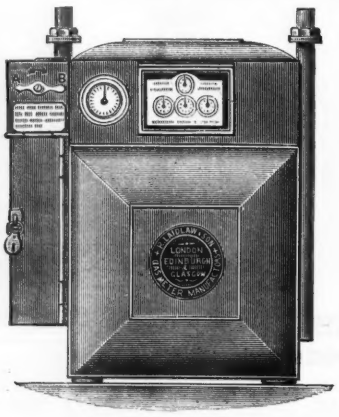

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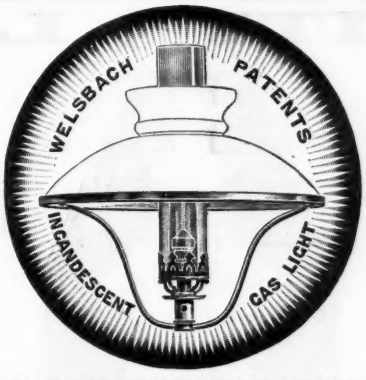

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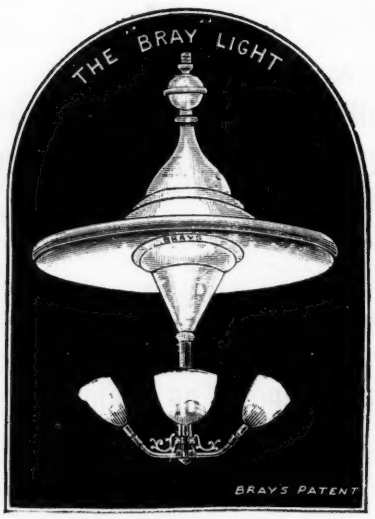

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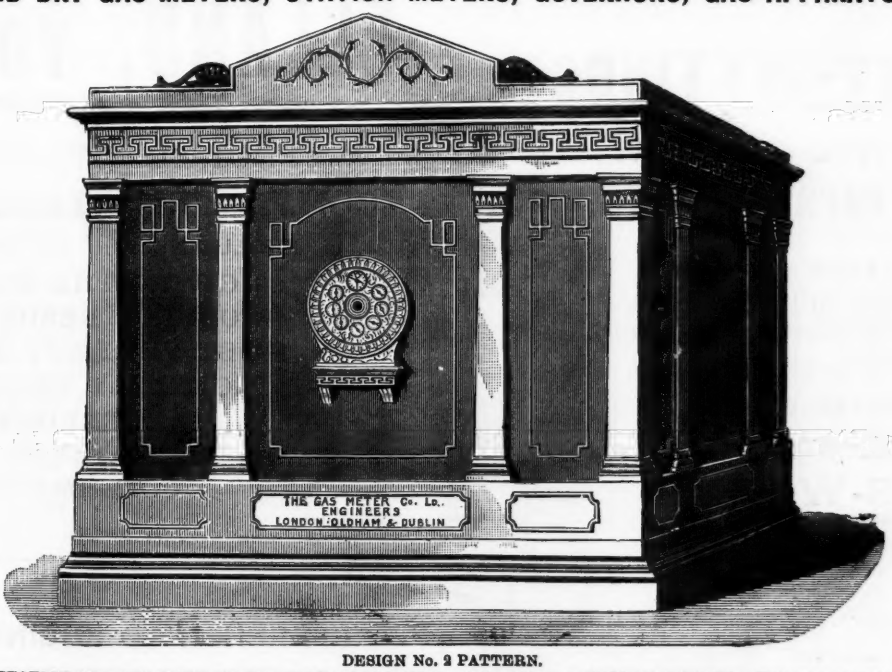

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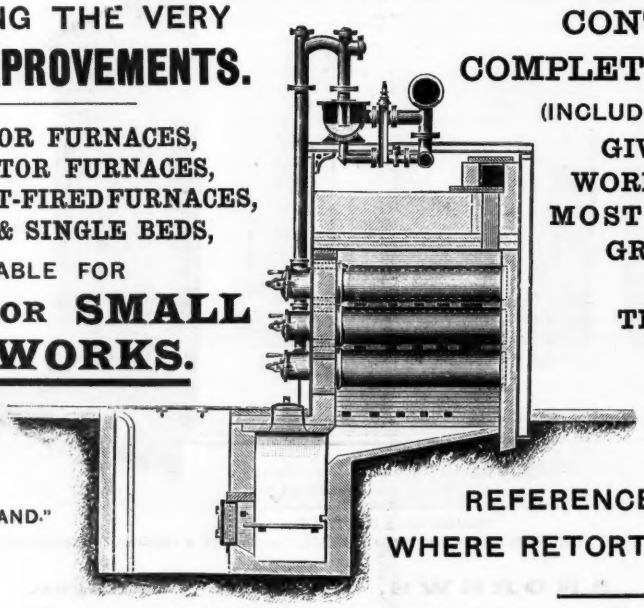

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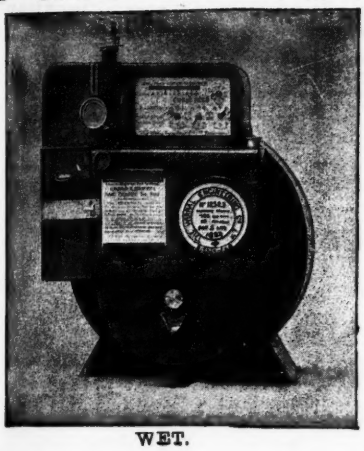

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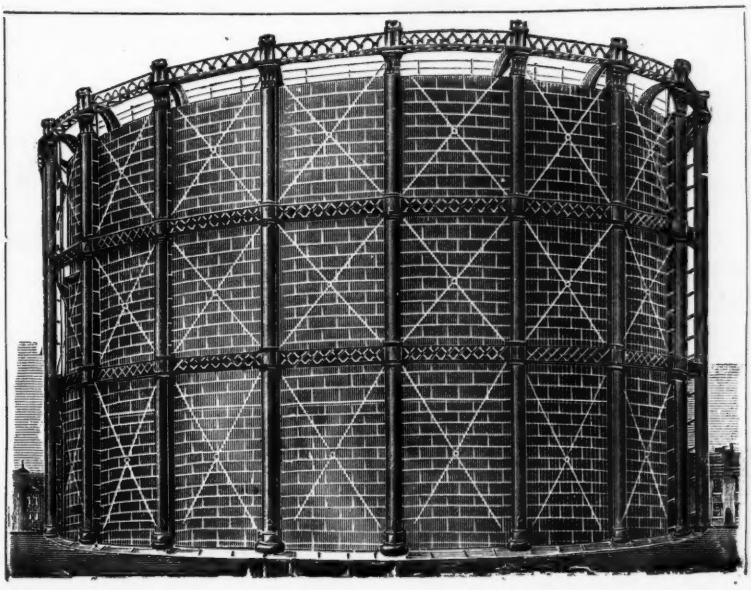

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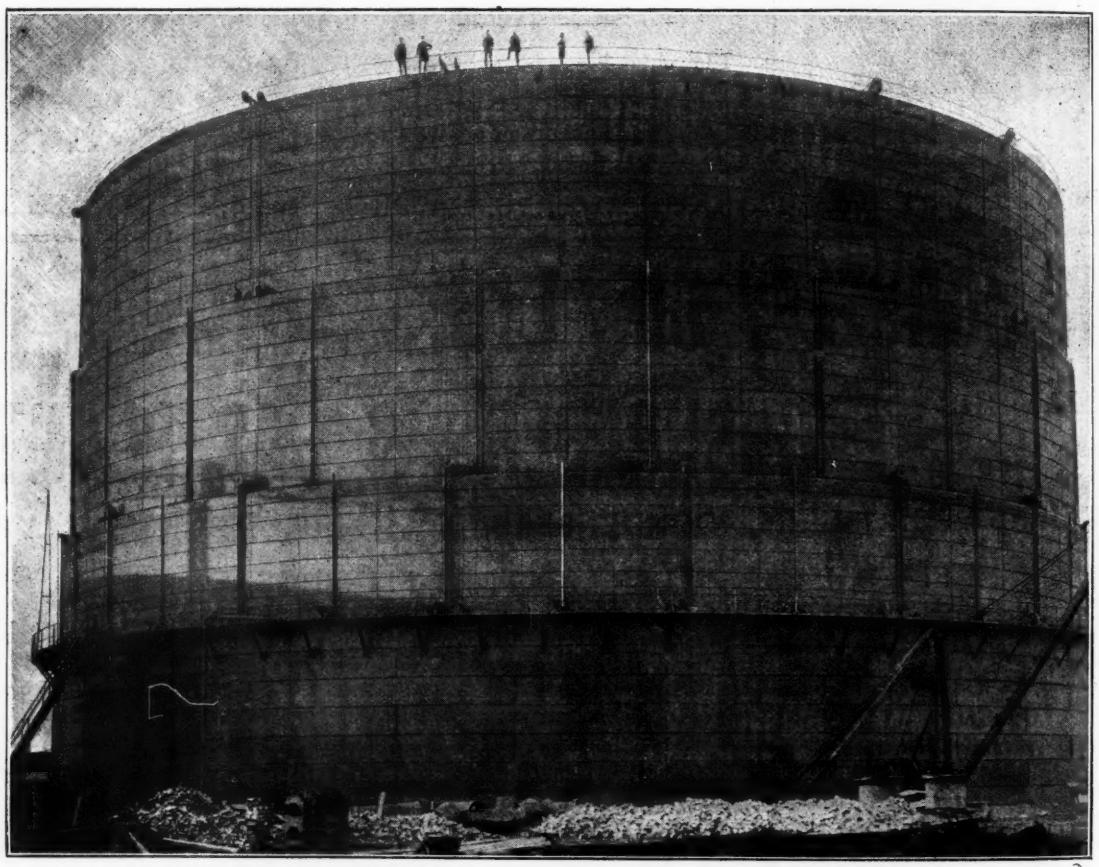

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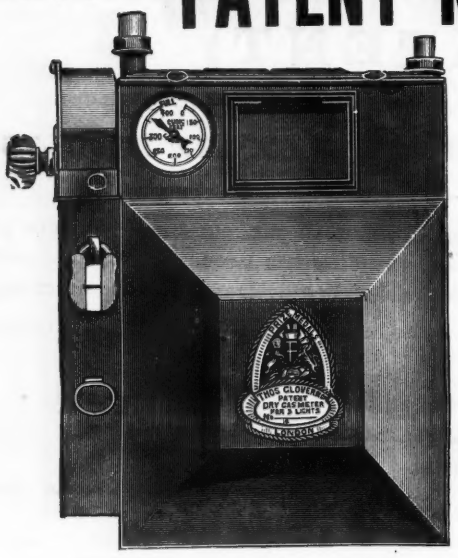

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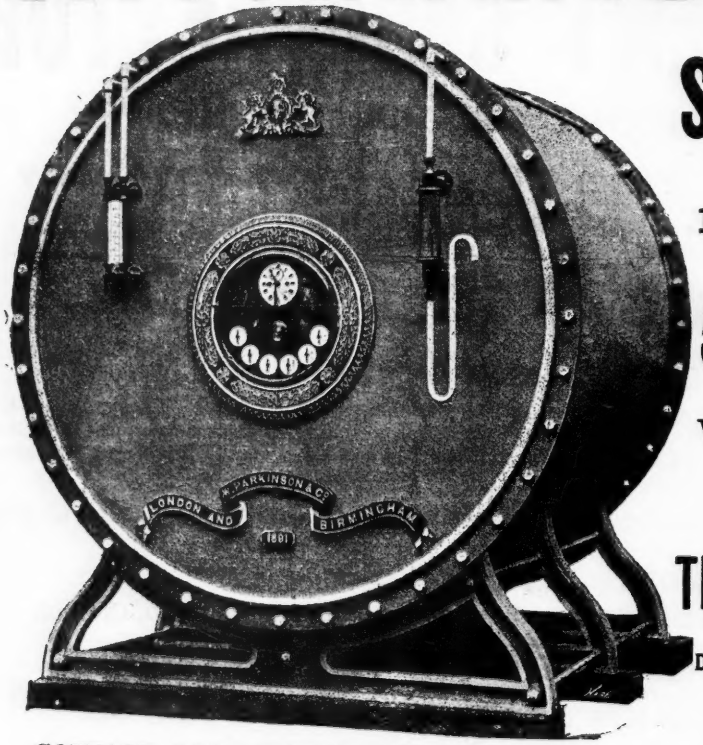

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TO CORRESPONDENTS.

No notice can be taken of anonymous communications. Whatever is intended for insertion must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

EDITORIAL NOTES.

The Parliamentary Notices.

THE most momentous topic in gas engineering circles at this season of the year is the prospects of the approaching parliamentary session. In the present issue, we are able to give this year's complete list of parliamentary notices relating to gas supply; and to this must be directed those of our readers who are interested to know who and what are "coming to Parliament" next session. The crop of notices is rather heavy, and contains some announcements of the first importance. We have already commented upon the South Metropolitan notice, and have nothing at present to add to our remarks upon this subject until the Bill appears. Meanwhile it may be mentioned that the Chairman of the Company, Mr. George Livesey, has been "interviewed" by a representative of the *Globe* newspaper; and his observations on this occasion are reproduced in another column. It was the indiscretion of some informant of that paper—notoriously the organ of the "stern, unbending Tories"—which caused the somewhat irregular disclosure of Mr. Livesey's workman-director proposal to the general meeting of the Company last February; and the *Globe* has been in opposition to the idea ever since. It prefaced the account of the interview, which appeared on Friday last, with the declaration that the "scheme is, to say the least, Utopian. "It is also premature," on the ground that nobody has asked for it. The notices of the two Cheltenham Gas Bills have been duly published by the Company and the Corporation respectively. The Company's Bill will include provisions for consolidating the capital into one class of stock bearing a uniform dividend. There is no news of the same kind from Derby, mentioned in these columns last week in conjunction with the Cheltenham transfer proposal. The Dublin Corporation's "omnibus" Bill will, as usual, contain some clauses to vary the conditions of gas supply in the Irish capital. The Corporation of Edinburgh have given notice of their intention to incorporate Leith and other adjacent districts within the boundaries of the city, which will entail the dissolution of the recently-constituted Gas Commission of the Edinburgh and Leith Corporations, the vesting of the powers and property of the Commission in the enlarged Corporation, and the acquisition of the undertaking of the Portobello Gas Company. The Huddersfield Corporation will seek to enlarge and vary their gas powers, and to absorb the undertaking of the Longwood Gas Company. The Guildford Gas Company propose to consolidate their capital and to improve their position in other respects. The Ilfracombe Gas Company, unlucky last session, are going to try their fortune again with what appears to be a somewhat similar Bill, which will include a capital consolidation scheme. The Leamington Corporation propose to acquire the undertaking of the Leamington Priors Gas Company, as already noticed in the JOURNAL. The Manchester Corporation are contemplating an extension of the municipal boundary. The Newcastle-upon-Tyne and Gateshead Gas Company will seek power to make extensions and raise additional capital. The Matlock Bath District Council wish to acquire the property of the local Gas Company; and the *imbroglio* at Sandwich is to be laid before Parliament. The Ystrad gas supply forms the subject of two notices, issued by the Local Authority and the Company respectively, and raising the usual questions. The Board of Trade will also be fairly busy with Gas Orders which will concern the districts of Chester-le-Street, Fort William, Laindon (Essex), Matlock Bath, Oswestry, and Settle. Three gas applications are to go before the Local Government Board, affecting the districts of Driffield, Sandwich, and South Molton—all of them contemplating the acquisition of Gas Companies' property. From these notifications it will be seen that the coming session bids fair to be a busy one in the annals of the statutory regulation of gas supply throughout the United Kingdom. All three capitals—London, Dublin, and Edinburgh—will have gas business in hand, and some of the principal English cities and towns will be similarly engaged; while in several instances small gas supply areas will be instrumental in raising important questions of gas administration and finance.

Meeting of the Manchester District Institution in Leeds.

THE members of the Manchester District Institution of Gas Engineers met on Saturday in Leeds, under the presidency of Mr. Isaac Carr, Vice-President, in the absence through indisposition of Mr. G. Smedley, of Buxton. A very satisfactory feature of the proceedings was the election of five new members, which argues well for the popularity of the Institution in the district which it serves so creditably. Two good papers were read at the meeting—by Mr. W. Newbigging and Mr. S. R. Ogden respectively—both of which will be found in another column. Mr. Newbigging's contribution dealt with a question of no small practical importance—the best arrangement of gas washing and scrubbing plant for meeting modern requirements in respect of ammonia purification. The author confesses to having a kindness for the tower scrubber. But he admits that the imperfections of the usual water-distributing arrangements are apt to render it an ineffective piece of apparatus at all times, while he gives up the problem of proper water distribution altogether in the case of towers more than 9 feet in diameter. It appears from the paper, however, that when the amount of gas washing to be done becomes a serious task, there is nothing for it but a washer-scrubber. This is to all intents and purposes the verdict of contemporary gas engineering practice. For small works, and indeed for works up to a very respectable size, the tower scrubber will answer every purpose, and is the proper appliance, more especially when in the hands of experts such as Mr. H. Green, of Preston. The output of a large works, however, cannot be washed in this way; hence the favour in which so-called washer-scrubbers are held by the managers of the largest works. It is whispered, however, that not even by their aid is ammonia purification always practicable to the mere "trace" that theory prescribes as readily attainable. Mr. Ogden's paper gave an account of the working at Blackburn of the carburetted water-gas plant erected for the Corporation by the Economical Gas Apparatus Construction Company, Limited, with recent carbonizing data of very great interest. It is a source of satisfaction to all parties concerned that this experiment has succeeded so well. Mr. Ogden's suggestion of a time when gas coal will be carbonized for its coke, the illuminating gas being produced by the cupola, is calculated to create the impression that a new epoch has indeed opened for the gas industry of the United Kingdom. The large attendance at the meeting and the interest taken in the proceedings amply justified the policy of holding such a gathering, of a purely business character, in Yorkshire. Mr. Isaac Carr has been elected President for 1896.

Humphreys on Photometry.

THE carefully-compiled paper by Mr. Alex. C. Humphreys, of New York, upon the "Commercial Value of Photo-"metry," which was read by the author at the recent meeting of the American Gaslight Association, and has been reproduced in the last three issues of the JOURNAL, is, on the whole, a trustworthy summary of the existing stock of information concerning the methods and results of photometry as practised in connection with gas supply. It is unquestionably a paper that reflects much credit upon the author; and it forms a valuable constituent of the transactions of the technical society which was instrumental in placing it before the gas engineering profession at large. If we understand the author's object rightly, it is that of defending photometry as a valid means of ascertaining and defining the illuminating value of a light-source, irrespective of any question of "diffusive power" or other considerations extraneous to strict photometrical investigation. If Mr. Humphreys has not succeeded in adding much that is new to the amount of information already available in respect of these matters, it is because there is little fresh knowledge to be gathered in the fields where he has so industriously searched for it. He evidently thinks he has disposed of the question of "diffusibility "*versus* photometrical reading" by his Twenty-First Street laboratory experiment. The practical issue, however, appears to lie in the consideration of what, for lack of a better term, may be called the "key-note" of an example of artificial lighting. The electricians are aware of this consideration; and whenever they have the opportunity, they endeavour to persuade their patrons that 8-candle lamps are capable of answering every purpose of interior lighting. The moment a 16-candle lamp appears upon such a scene, the whole aspect of the interior is changed, and the lower scale of lighting is perceived to be dull. Change the "key" to the 16-candle pitch, and the same result is produced, only to be upset again with the advent of a 20-candle lamp. So we might go on until the rising standard of brilliant lighting is hardly satisfied with an installation of full-sized arc lamps spaced a few feet apart. Where, then, is the line to be drawn? Nobody we ever heard of denies that what the photometer calls a 20-candle light is more brilliant than the light which the same instrument rates at 16 candles; but it by no means follows from this that the former is more suitable for use as a unit of lighting than the latter. The responsibility of the lighting expert begins where the work of the photometrist ends. It is true, as Mr. Humphreys admits in the concluding paragraph of his paper, that "the intensity of illumination, either of an "open or of an enclosed space, cannot be made uniform "by the employment of any artificial light-source;" and we are disposed to agree with M. Blondel [*vide* last week's JOURNAL] that uniformity would not always be desirable if it could be attained. But it is certain that the more intense the light-sources that are to be employed, the more difficult it becomes to make effective, agreeable, and at the same time economical use of them.

The Strike in the Engineering Trade.

DURING the middle of last week, hopes were raised of a speedy settlement of the dispute in the engineering trade. Though by Saturday these aspirations were again clouded over, they can hardly be said to have completely died away. No specific grounds were named for these anticipations; but the expectation seemed to have been formed, by many people who ought to know how matters were shaping, that before long the masters and the men would agree to meet in conference under a neutral Chairman. It was, indeed, announced by a news agency that such a meeting had been arranged for. Meanwhile, it is so far satisfactory to observe that a good deal of the rancorous, one-sided "fustian" vented in regard to the employers' action by the "popular" newspapers has given place to acquiescence—sullen, of course, but still acquiescence—in the proposition that combined action is as proper for one side as the other. Some of the newspapers which began by clamouring for Government interference with the employers' arrangements have been fain to confess that, after all, Government has no more power to compel private engineering works to be thrown open than to drive unwilling men into them. The fact of the matter is that hitherto workmen and their flatterers on the platform and in the press have been accustomed to think of combination as a panacea of their own devising, and reserved for their own use. It is stated in the preface to the rules of the Amalgamated Society of Engineers that "organization gives to men a special "character, and is a source of strength. It keeps them "compact, and concentrates their efforts towards one end; "whilst without it they are both weak and ineffectual, "exercising no influence or control over their own future "condition." It never seems to have occurred to those who preached and insisted upon the practice of this dogma of Trade Unionism that two parties could adopt and act upon it, as in the present instance.

A weighty utterance upon the crisis which this action has brought about in the engineering trade has been offered by Colonel Saunderson, M.P., in a letter to *The Times* of the 27th ult. The writer perceives that this is now a struggle between two really powerful organizations, and, in the circumstances, he thinks that either Mr. Balfour or Mr. Chamberlain should offer, on the part of the Government, "to consider the whole question of the strike, and arbitrate "on the merits of the case." More than this it is not suggested that anybody could do. Colonel Saunderson also declares with reason that what is wanted most urgently in connection with industrial disputes of this character is some reliable means of ascertaining and putting the public in possession of the rights of the case. We have heard enough about Boards of Conciliation and Arbitration for the settlement of trade disputes; but it has been an insurmountable obstacle to the acceptance of any such devices that they would have no power for enforcing their decrees. The case for a Board of Investigation, however, stands upon a different footing; and the only complaint we have to make against Colonel Saunderson's letter is that he fails to distinguish sufficiently between the cases and prejudices what he appears to be desirous of recom-

mending by confounding it with an old and discredited suggestion. On the other hand, it might be objected that almost as much goodwill on both sides would be needed to render an inquiry fruitful as would go to a composure of the difference. Still, if there was an authority established for the express purpose of investigating the causes and sources of disputes, and any interested persons refused to supply information which it was known to be in their power to give, it would look bad for their case. The ultimate power behind both investigation and arbitration is public opinion. But whereas it might be possible for the award of a Board of Arbitration to fail to satisfy public opinion, this force would be free to satisfy itself with reference to the results of investigation. We have in this favoured land a Government Department which, if it were good for anything, might undertake this duty of investigation. But, unhappily, it is pretty well understood by this time that the Labour Department of the Board of Trade does nothing of consequence to anybody besides finding offices for a mere handful of lucky ex-agitators. The sooner this expensive failure is cleared away the better.

Mechanical Road Carriages.

The offer of a handsome prize by our contemporary the *Engineer* for the encouragement of the application of mechanical power to road carriages (already noticed in these columns), has now taken definite form. The competition is to be international, and the competing vehicles are to be entered in four classes. For full particulars, reference should be made to the *Engineer* itself. So far as our interest in the competition is concerned, it is hardly necessary to say that this is limited to the prospect of coal gas being selected by some competitors to furnish the motive power. It is impossible to predict that such a selection will be made; but it is certain that coal gas is not precluded by the conditions, which state upon this head that "any "method of propulsion other than muscular power may be "employed, provided it be contained in the vehicle." Combustible liquids or spirits below ·8 specific gravity or a flashing-point under 73° Fahr. (Abel's test) are expressly excluded. In this matter, as well as in the limitation of the normal speed of the vehicles to ten miles an hour, we find confirmation of views of our own expressed in our earliest notice of the proposed competition. The first trials can hardly take place before next October; and meanwhile there is reasonable hope that the existing statutory disabilities of mechanical road carriages will be modified or removed.

An interesting paper on the subject of "Locomotive "Carriages for Common Roads" was read before the Society of Arts on the 27th ult., by Mr. H. H. Cunynghame, which gave a summary of what has been attempted in this respect. Naturally, the historical steam carriage of Murdoch came in for mention. The circumstance of their great prototype having laboured in this branch of mechanics should of itself be a sufficient reason for gas engineers to take an interest in its modern revival. Mr. Cunynghame thinks, however, that Murdoch's steam carriage was "not carried beyond the experimental stage;" and certainly it is not for his part in this as yet unrealized endeavour that the grand old Scotch millwright is chiefly remembered. It seems clear that in Murdoch's time the problem of applying mechanical power to road carriages was a more popular study among mechanicians of every degree than it has been since rail and tramways came to put the road in a second place to the rail. It is only with the modern rehabilitation of the road as a means of travel, through the "cycle," that the idea of reviving the problem has taken form as a question of the day. With the cycle in this agency must be associated the steam and cable tram and the electric "light" railway. Indeed, there is a well-defined movement afoot in these modern days for the elimination, as far as is possible, of animal power from the conduct of street traffic, for several reasons which need not be gone into here. Mr. Cunynghame warned his hearers that the prospect of the application of electric power to road carriages is at present very slight. It would be as much as a battery of accumulators could do to drive a car capable of carrying their own weight. It is a little remarkable that until the last year or two mechanically driven road carriages have hardly been heard of, even in countries where their use has not been forbidden. But it would not be fair to argue from this that mechanically driven carriages are not likely to come into general use.

WATER AND SANITARY AFFAIRS.

We made mention last week of the several Water Bills affecting the Metropolis—pointing out, in the course of our remarks, the chief features of the scheme for the establishment of extensive reservoirs at Staines. We also referred to the Bill by which the New River Company propose a series of additional works, involving a large expenditure, for purposes of construction and improvement. Mention was made of the Bill of the Southwark and Vauxhall Company, and the project for the creation of a Kent Water Board. The Bill for this last-named object it appears is not to be proceeded with unless the London County Council revive their scheme of purchase. The Southwark and Vauxhall Bill comprehends new works of considerable magnitude; including four new reservoirs, each having a water area of 250,000 square yards. Perhaps the size of these reservoirs will be most readily appreciated by a good many persons, as being equal, in each case, to an area measuring 500 yards in length and breadth. The reservoirs are all to be situated at Walton-on-Thames, in Surrey. There are also to be two separate wells and pumping-stations at Harefield, in Middlesex. The East London Water Bill is, as we mentioned recently, a measure to be brought forward by the County Council, requiring the East London Company to maintain a constant supply of water at such a pressure as to force it to the top of the highest houses in their district. In the case of failure, the County Council are to have power to sue for penalties. This Bill was kept in abeyance until the transfer scheme broke down. Had the prospect of buying up the present Metropolitan Water Supply been maintained, the Council would have disdained any such obligation as they propose to lay upon the East London Company. The situation is thus a very critical one for London in respect to the water supply question in the next session of Parliament. Five out of the eight Metropolitan Water Companies propose new and extensive works, involving a very large outlay of capital; and if these schemes are sanctioned, the County Council project for bringing a supply of water from Wales, at the cost of many millions, may as well be at once abandoned.

The Bills affecting water supply outside the range of London and its suburbs are somewhat numerous. The East Surrey Water Company seek authority to purchase the undertakings of the Reigate and Kenley Water Companies. The Corporation of Brighton intend applying for sanction for the transfer to them of the undertaking of the Shoreham and District Water Company. The Birmingham Corporation, among other things, are desirous to alter the line of the aqueduct sanctioned by their Water Act of 1892. At Sheffield, the Corporation propose the construction of new reservoirs, and the execution of various works in connection with the water supply. Power is further sought to divert and use the waters of the Little Don or Porter River and its tributaries; as also to supply water to the Corporations of Barnsley, Rotherham, and Doncaster. The Bill, altogether, is one of considerable importance. The Portsmouth Water Company contemplate certain extensions, and the acquisition of additional lands and springs. The Corporation of Chester have a Bill giving them power to construct a weir across the River Dee, and to prevent the pollution of the river higher up. Contributions are to be made towards the expenses by the Chester Water Company, and by landowners whom the works will benefit. The Derby Corporation desire to obtain, by agreement or compulsion, all or part of the undertaking of the Meerbrook Sough Company, and to construct certain works. On the South Coast, there are two Bills relative to Eastbourne. The Corporation of that town are going to apply for an Act by which they shall be empowered to introduce a new supply of water. Power is sought to purchase the undertaking of the Eastbourne Water Company, by compulsion or agreement. In addition, the Eastbourne Water Company give notice of a Bill to extend their limits of supply, and to authorize the construction of new works, with power to enter into agreement with the Local Authorities as to the supply of water in bulk. There is a scheme in South Wales, by which the Urban District Council of Ystradyfodwg seek power to purchase the undertaking of the local Water Company, and to construct new works. There is to be an arbitration clause in which power will be given to the

arbitrator to make deductions from any compensation claimed by the Company, such deductions having reference, among other points, to the probable necessity for the future introduction of a new source of supply. Though not going quite so far, the clause bears a singular likeness to the famous arbitration clause in the Transfer Bills of the London County Council.

Across the Tweed, Edinburgh gives notice of a Bill for various purposes, including an absorption of the District Water Trust. In Ireland, the Dublin Corporation have a scheme for supplying water, under certain conditions as to quantity, to the Commissioners of nine different townships. Throughout the various projects which are to come before Parliament in the coming session, there are frequent provisions for an extension of the area of supply, and necessarily for the raising of fresh capital. Though a little outside our province, we might call attention to a Bill for power to form a Company in order to bring a supply of sea water to London—the head works to be at Lancing, in Sussex. The idea is by no means new; and we question whether it contains the faintest germ of a dividend, even supposing Parliament can ever be induced to sanction such an enterprise.

The Brighton Corporation and the Shoreham Water-Works.—At an extraordinary meeting of the Shoreham and District Water-Works Company held on Monday last week, assent was given to the sale of the undertaking to the Brighton Corporation for the sum of £37,257, in 3½ per cent. stock of the Corporation, redeemable in 1946; and the Directors were authorized to carry out the sale.

Memorial to the Late Mr. H. F. Willey.—A memorial to the late Mr. Henry Frederick Willey has been placed in St. John's Hospital School, Exeter. It has been erected by past scholars of the school, and consists of a brass tablet, mounted on marble, and bearing an inscription which states that Mr. Willey was "educated in the school, and was successively Sheriff, Alderman, and Mayor of this his native city." It also gives the date of his death—Feb. 27, 1894. The memorial was unveiled last Tuesday by the Town Clerk (Mr. G. R. Shorts), and was accepted by Mr. E. A. Sanders on behalf of the Governors. Both Mr. Shorts and Mr. Sanders spoke highly of Mr. Willey, not only as a business man and a citizen, but in his private life; the Town Clerk remarking that he was one who, in the language of Scripture, "feared God, loved the brotherhood of his fellow-men, and honoured the King."

Personal.—Mr. A. Graham Dow, who has resigned the managership of the King's Lynn Gas-Works after being thirty-six years in the Company's service, was recently presented by the workmen with a silver tea service, accompanied by a framed illuminated address, as a mark of their esteem, and in recognition of his unfailing kindness to them.——Mr. C. Lucas, who has been Chairman of the Newbury Corporation Gas Committee for the past fourteen years, recently signified to his colleagues his desire to relinquish the position. The Committee have passed resolutions recording their best thanks for the able services of Mr. Lucas, and electing Mr. B. Smith to succeed him.——The gross value of the will of the late Mr. F. O. T. Delmar, a Director of the San Paulo Gas Company, has been put at £185,699, of which £100,000 is to be set aside for the establishment of the Delmar Charitable Trust, the income from which is to be divisible among various public institutions.

Mr. Harrison Veevers and his Appointment at Dukinfield.—Last Saturday's *Ashton-under-Lyne Reporter* said: "We have some startling news to record with regard to the administration of our local affairs. It is well known that Mr. Harrison Veevers has for many years held the dual appointments of Surveyor and Gas Engineer; and the arrangement has, so far as we know, worked satisfactorily. However, a change is about to be made. A special meeting of the General Purposes Committee was held on Thursday evening; and it was decided to sever the two offices, and advertise for a Surveyor at £120 a year. Mr. Veevers is to devote all his time to the management of the gas-works at £250 per annum. Why this drastic change should be made, the Committee have not yet vouchsafed a reason to the public, and not even to the gentleman immediately concerned. In the year 1880, Mr. Veevers was appointed Surveyor and Gas Manager; and he retained the appointment for three years. He then relinquished the office in consequence of the great demand upon his services at the Denton Gas-Works, which then belonged to Dukinfield. Five years afterwards, the Local Board asked him to take the dual control again; and he has held them ever since at a salary of £320 a year. Now the majority in the Council has changed its mind. The component parts of this public body are of a different calibre to those who ruled the affairs of the township some 15 or 20 years ago; and we know not what a day may bring forth. We are sure the majority of fair and impartial people will consider the General Purposes Committee, or rather those who were in favour of the resolution to bring about this change, are treating Mr. Veevers in a very shabby manner."

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1159.)

LAST week brought about a wonderful change on the Stock Exchange; and to an extent that must have been far beyond all anticipation. From the opening, a cheerful influence prevailed; and it was soon found that the outlook for the settlement was unexpectedly favourable. As the incubus which had pressed so heavily was lightened, the recovery became more pronounced. To supplement this tendency, came intelligence from the East of a more agreeable character; and, though this was somewhat modified before the close by later news not quite so happy, yet, on the whole, the week has accomplished a remarkable recovery. As a natural consequence, prices have risen smartly, and the reinstatement extends to every department. Perhaps all difficulties arising from the overbuying of recent months are not yet smoothed away; and a few awkward hitches may attend the further disentanglement of the coil. But the worst is over; and the end is in sight. The requirements of the settlement were not sufficient to do much for the Money Market, and rates were light, and money is easy. Business in the Gas Market was quieter on the whole than in the preceding week; and movements were a little irregular. Changes in quotation were few in number, and very slight in degree; and on a balance there was rather more retrogression than advancement. Gaslight "A" was moderately active only. It opened steady at good middle figures; and then on Tuesday the quotation was put down. But, in spite of this, prices came out rather better, so that on Friday the quotation had to be restored, and with half a point to the good. Gaslight secured issues were in capital demand, especially the 10 per cent. preferences, which changed hands at big figures. South Metropolitans were quiet and rather dull. The "B" dropped a point; but the "A," on the other hand, commanded top price. There was nothing particular to note in Commercials. The Suburban and Provincial division were even more than usually inactive; and no change of any sort occurred in their prices. Among the Continentals, business was entirely confined to Imperial, which opened flat, and had a further fall; but the price then appearing attractive some rather smart buying came in, and gave a better tendency. Cagliari receded a point. Among the remoter undertakings, Monte Video had a slight relapse; but Oriental advanced in response to the favourable report and accounts for the year. Water was unsettled; and the tendency, on the whole, was adverse—East London and Southwark being more especially weak. Chelsea, on the other hand, improved.

The daily operations were: Business in Gas was not particularly active on the opening day; and prices for the most part were only moderate. Imperial Continental fell 2. Water was steadier; and Chelsea advanced 2. Transactions in Gas on Tuesday were still quieter; and the tendency was easier. Gaslight "A" receded 1½; and South Metropolitan "B," 1. Water was weak—East London falling 1; and Southwark, 2. On Wednesday, Gas continued quiet; and the only move was a fall of ½ in Monte Video. East London Water dropped 2 more. Thursday was more active; and prices were a little better. Oriental rose ½. In Water, Southwark fell 3; and Lambeth tens, 2; but ditto 7½ per cents. moved up 2. The tendency in Gas on Friday was favourable; and Gaslight "A" rose 2. Southwark Water fell 2 more. Saturday was very quiet. Gaslight 4 per cent. debenture rose 2.

ELECTRIC LIGHTING MEMORANDA.

The Lesson of Fareham—The Hardship of the Fareham Case—The Responsibility of Members of Local Authorities to their Constituents.

A SHARP lesson to local authorities inclined to be a "law unto themselves," and to fancy they can play fast-and-loose with their engagements, was administered by the Lord Chief Justice last week in disposing of an action brought by the Fareham Electric Light Company, Limited, against the Fareham Urban District Council. The facts of the case were not in dispute. It was shown that the old Fareham Local Board entered into an agreement with the plaintiffs to purchase their electric lighting undertaking as a going concern, at a price to be awarded by two arbitrators—the purchase and transfer to be completed within two months after the award, and after approval and sanction by the Board of Trade and the Local Government Board; and the defendants further agreed to use their best endeavours to obtain from the Local Government Board the necessary sanction for the transfer and for the borrowing of the money required for the transaction. Matters took their regular course for a time; the price of the property being determined at the sum of £4866, and the consent of the Board of Trade being duly obtained by the Company. The Local Board also set the Local Government Board in motion; and a local inquiry was held. Between the time when all the preliminaries were completed and the issue of the Local Government Board's reply upon the project, the Parish Councils Act came into operation; and the new local authority elected under the Act

contained a majority averse to going on with the scheme. Consequently, the application was abandoned. Thereupon the Company took proceedings against the local authority for breach of the agreement entered into by their predecessors. The law of the matter was clear enough. There was an agreement, and it had been violated by the local authority, who were, of course, bound to fulfil the obligations of their predecessors in office. Judgment accordingly was given for the Company—damages, £3800.

The law and the strict justice of the case having been thus vindicated, it is possible to admit that, on the merits of the affair, ratepayers of the locality affected have been caused to suffer undeservedly at the hands of those to whom their interests were formerly committed. It seems to have been a conspicuous example of a state of things unhappily not peculiar to this particular district. The local Gas Company had somehow become unpopular; and an Electric Lighting Company was formed to light the place under the benevolent auspices of the Local Board. Again, there is nothing unusual in the results of this adventure. The light was voted a success; but the Company who supplied it were not equally fortunate financially. In their extremity, the Company sought for relief from their embarrassed circumstances in a sale of their undertaking to their good friends, the Local Board; and they did not seek in vain. In the meantime, however, the inhabitants of the district awoke to a sense of what was going on between their representatives and the electric lighting speculators. The public might not have liked the Gas Company, and might not have been unwilling to see the electric light enter the field as a competitor with gas. But when it was known that the Local Board meant to saddle the district with the new light, and devote public money to the support of what had turned out to be a commercial failure in the hands of its original promoters, the impression was created that here was going to be a case of "jumping out of the frying-pan into the fire," in the matter of the pubic lighting. So the elections to the new authority which was to supersede the old one, turned upon the electric light question; and in the event the consenters to the bargain with the Company were sent packing. There seems to be no more question concerning this order of facts than about those of the agreement and the award, and the failure to go on with the application to the Local Government Board. The old Local Board—out of touch with public opinion on the matter—had agreed to a course of action which their successors had an express mandate from the electors to reverse. Unfortunately for the ratepayers, however, the old Board had acted strictly within their powers in this regard; and consequently the only way out of the miserable business is by paying.

It is not so easy to see how the plaintiff Company can have been so injured by the dropping of the transfer scheme as to be fairly entitled to the substantial damages awarded by the Court. It would doubtless have been a splendid thing for them to have got back from the Fareham Local Board all the capital, to within a few pounds, represented by their unprofitable venture. But if their property was honestly worth the price which the arbitrators would have made the local authority pay for it, there cannot be much hardship, the ordinary man would be disposed to think, in their being constrained to keep it. We do not desire to enlarge upon this aspect of the case, which is of very great importance to the lighting industries as well as to local authorities. But it can easily be understood that there is a strong public feeling in Fareham with regard to the manner in which the public interest has been dealt with. The affair should be a warning to all members of local authorities who may be in danger of allowing their predilections for a system of lighting or any other outside interest to carry them into courses not approved of by those whose wishes, as well as interests, it is their first duty to follow and subserve. In the ordinary transactions of the duly appointed authorities for any local government district, there is nothing to specially interest (much less to excite) the non-official public who pay for all, in the ordinary way. So it sometimes comes about that the well-meaning, busy gentlemen who undertake to do the public business for their fellow-ratepayers, forget that they are let alone in doing it mainly because it is generally felt that they are to be trusted in all routine matters, and cannot in any case do much harm. And if they should vary their monotonous official occupations by a quarrel with the local gas company, the public will rather enjoy the squabble than complain about it—so long as little or no money is spent in law costs. But whatever may be their strict legal rights in such a matter, no prudent, self-respecting member of a local authority will take the responsibility of placing himself, and those whose interests he is bound to protect, in such a position as that now occupied by Fareham. There are, indeed, very few occasions in the history of a local government district where the governing body can exhibit statesmanship or the opposite quality. There is the drainage; there may be a question of water supply, of tramways, of street improvements, or of public lighting. Besides these, there is hardly anything over which a local authority for a small district or moderate sized town can distinguish itself, or make a mess of. Why, in the name of all that is reasonable, should a chairman or other member of a local board, "dressed in a little brief authority," go out of his way to get into hot water? What is there in electric lighting that the members of any District Council should strive to force it down the throats of an unwilling populace, laying themselves open by so doing to all sorts of injurious imputations of motive? Lastly, must there not be something wrong about our system of local government, and its supposed control by head-quarters, when an Urban District Council, by merely dropping an application to proceed with a scheme for the purchase of a property, can involve the ratepayers in such loss as that now visited upon Fareham? There is a parade of protecting the ratepayers by the system of local inquiries into the desirability of doing certain things, and certain other things cannot be done without the supposed safeguards of advertisement and the holding of public meetings. Yet here is a case of victimizing ratepayers merely by civil process. It may be quite right and proper; but, from the ordinary unofficial ratepayers' point of view, the subject would appear to call for further investigation. Execution in the Fareham case has been stayed until Jan. 15; so the end is not yet.

DENNY LANE.

It is with sincere regret that we have to record the death of Mr. Denny Lane, the Secretary of the Cork Gas Company, which took place last Friday evening, at his residence, South Mall, Cork. He was taken ill about three weeks ago; and though hopes were entertained of his recovery, he had a relapse, and passed away peacefully surrounded by his family.

Mr. Lane was born on the 7th of December, 1818; and he was the only child of Maurice Lane, the owner of the Clintown Distillery, Riverstown, and one of the members of the first reformed Corporation in Cork. He was educated at a well-known school in the city at that time—Hamblin and Porter's—and received there the groundwork of a sound education. Even at an early age, he showed an aptitude for learning, and a literary and inquiring taste far above that of youths of his class. At the age of 18, he graduated at Trinity College, Dublin, where he took his M.A. degree. He afterwards went to London, and attended lectures at the Inner Temple, and took his B.L. degree, and was called to the Bar about the year 1842. His mother had died when he was only four years of age; and his father's death occurred while he was prosecuting his studies in London. He became heir to a very large property; but he rapidly lost much of his estate through endeavouring, as he said himself, to promote local industries, and engaging labour that did not pay. Some of his schemes were, however, successful. Mr. Lane, as he grew to middle age, began to take an interest in the political movements of the day; and, associated with the men of 1848, formed a fast friendship for Smith O'Brien, Meagher, Mitchell, Davis, and other leaders of the Young Ireland Party. The result of his connection with this movement was that in 1848, during the suspension of the Habeas Corpus Act, he was confined in Cork Prison for four months. But he was never actually brought to trial. Mr. Lane was possessed of exceptional prudence and foresight. On two occasions he impressed upon the leaders of the movement that they would not get the support they expected from the country; and he counselled a more prudent course. But the leaders believed they had gone too far to withdraw. After Mr. Lane's liberation, he took a more or less prominent part in politics up till a comparatively late period. In 1876, on the death of "Joe" Ronayne, he contested the city in the Home Rule interest; but he was opposed by John Daly, also a Home Ruler, and Mr. W. Goulding. The latter was successful—Mr. Lane being at the bottom of the poll. Defeat seemed to discourage him somewhat, and though he did not afterwards take so active a part in political life, he never concealed his opinions of men and things around him.

To speak of the many enterprises with which Mr. Lane was associated, or the societies, learned and commercial, which he adorned, would occupy much space. He was connected in 1868 with the starting of the Cork Gas Consumers' Company, which took the place of the old Gaslight Company; and this connection lasted till the day of his death. He promoted the Cork and Macroom Railway Company in association with the late John Francis Maguire, Timothy Mahony, and Joe Ronayne, and he occupied for a long series of years the position of Vice-Chairman of the line. He was a Director of the Passage Railway, a member of the Cork Harbour Board, and President of the Cork Literary and Scientific Society for the years 1884 and 1885. On several occasions he addressed the art students of Cork in speeches whose value may be judged from the fact that two or three of them have been reprinted in magazines. Equally strong was his interest in science. He was Chairman of the School of Science; and he devoted a great deal of his time to the subject, as connected with gas, steam, and electricity. Everyone connected with the gas industry will remember the circumstances of Mr. Lane's first election as President of The Gas Institute, the able address he delivered at the Institution of Civil Engineers, and the tact and geniality with which he conducted the proceedings of the meeting. Fresh in their recollection also will be his second election to the office, and the various incidents of the meeting in Belfast in 1893. Nor will anyone present at the banquet at the Crystal Palace on the occasion of the visit of French gas engineers to London, readily forget how Mr. Lane addressed to them, in their own language, some felicitous

allusions to the old alliance between their countrymen and the Irish. Mr. Lane was a welcome contributor to the Transactions of The Gas Institute; and in 1886 he was awarded the first premium and the President's Medal for his paper on the "Gas-Engine," read the previous year at Manchester.

The foregoing is but an outline of a career full of activity, and full of usefulness to the city and country of which he was proud—a career, too, in which self-sacrifice was a prominent feature. Mr. Lane was a cultured Irish gentleman; and, while a patriot, he had the broad-mindedness of every well-read man. He could speak readily on a great variety of topics; and his remarks were always instinct with learning and shrewd observation, enlivened by an Irishman's characteristic wit.

Mr. Lane leaves a widow and two daughters, to whom, in their great bereavement, the sympathy not only of his colleagues and fellow-citizens, but of the larger circle of friends and admirers in the world of science, will, we are confident, be freely extended.

REVERSAL IN INVENTION.

THE phenomenon of invention is something that powerfully attracts and interests practical, work-a-day humanity. The fact that every now and again somebody is found to suggest an improvement upon, or an addition to, the multitudinous appliances employed by civilized men with the object of increasing the comforts, reducing the inconveniences, or cheapening the cost of living, is an unfailing cause of admiration for the multitude who never think of attempting anything of the kind. Small wonder is it, therefore, that, in the estimation of the populace, the faculty of the successful inventor is held to be a "gift," which must be a birthright of its possessor, and cannot be compassed by study and effort. On the other hand, those whose calling brings them often and intimately into contact with persons of an "inventive turn," as it is significantly termed, are apt to take an altogether different, and much lower, view of the mental quality in question. There is a wide divergence between the estimate of the inventive faculty entertained by those who regard inventors—whether commercially successful or otherwise in their self-imposed efforts—as an order of superior beings deserving of public recognition and support, and that commonly held by the hard-headed individuals who perceive in every inventor first and foremost a person who is aiming at a short cut to fame and fortune. Both views might be supported by many illustrative examples taken from the life; but in this, as in most other matters of opinion, the truth lies, as a rule, somewhere between these extremes. As we have taken more than one occasion for showing in these columns, no more pernicious counsel can be given to those who have their living to get, and whose inclinations or circumstances impel them to seek it in engineering and mechanical branches of industry, than to urge them to try and "invent something," with the object of being able to live happily without work ever after. It would nevertheless be almost as great an error to attempt to belittle or ignore the great part which true invention plays in the development of all industries, not the least that with which the JOURNAL is specially identified.

The riotousness of the spirit of inventiveness in certain communities—as, for example, that of the United States—has created in some observers a revulsion of opinion against the popular idea which takes it for granted that invention exists as an entirely separate product of the industrial mind. Thus an American engineering writer has actually argued that what is usually called invention is nothing more than the rearrangement of certain factors which are common property to subserve a particular purpose. From this point of view, every new piece of work not wholly done by a self-acting machine is a product of invention, inasmuch as the makers must have used their tools, and applied their skill, to novel ends before it could have taken its final shape. There is something in this view, of course, although it is not the whole truth. When a handicraftsman hits upon a novel way of doing any part of his work, or when the product is so far a novelty as to have required in its fabrication fresh methods of manipulating materials or using tools, the result is in its degree as fairly entitled to be called an invention as is the outcome of a fresh application of the enormous mental and other resources of a Siemens, a Bessemer, or a Maxim. It is difficult to say in regard to the enormous output of a truly great inventor, as he would be popularly called, what is originated by himself and what might be traced to his mastery of the means and methods of his particular speciality. There is invention everywhere, or it is nowhere. Never was a piece of work worthy of the name of engineering construction done in the world but demanded for its proper execution more or less ingenuity, which was as truly invention as anything for which a patent has ever been granted. Every engineer who has had the supervision of large works has had occasion to note how that resourcefulness of the workman, which is indistinguishable from inventiveness, never fails to meet day by day and hour by hour those little difficulties of detail which no superior foresight could have prevented; so that the quickness of execution, and even the quality of the work done, exhibit advances as it goes on towards the appointed end. Remembering this fact, it is impossible to wholly withhold agreement from the assertion that the inventive quality has no distinct existence, but is only a phase of aptitude.

Following up this line of argument, it can be used to demolish the pretension, advanced by some other engineering writers, that there exists a "science of invention." For example, a Mr. Edward P. Thompson has been amusing the members of the Franklin Institute of America with a lecture in which there occurs the sentence: "Invention as a science has not received the same attention as physics"—a statement which is absolutely nonsensical. There is not, nor indeed can there be, a science of invention so long as the two words "science" and "invention" retain their ordinary and accepted meanings. It is true that there is a systematic as well as an unsystematic way in invention; but this is a very different idea to that of ascribing system, or science, to invention. Mr. Thompson may be pardoned, perhaps, because his whole lecture is a terrible example of imperfect expression. We take notice of it, however, for the sake of the very suggestive idea in regard to inventions which it is meant to convey. It is the lecturer's object to set forth the important part played in the history of mechanical inventions by what he calls "the principle of reversal;" and it so happens that practical gas engineering supplies us with several very good examples of this so-called principle which Mr. Thompson does not mention.

Of course, there is nothing new in the discovery that many a new process or machine is only an old one turned "the other way about." Mr. Thompson evidently flatters himself that it was reserved for him to "first make positive once for all the principle of reversal, and secondly to emphasize the importance of its systematic application to all inventions, past, present, or future, especially all leading inventions." It is hardly necessary to state that there is no more familiar type of inventor than the genius who is persuaded of the possibility of doing great things by turning somebody else's device upside down or inside out—making the product the producer, and so forth. Yet it is undeniable that the reversal of some processes and mechanisms has taken a long time to bring about. The example of the dynamo and the electric motor is made a great deal of by Mr. Thompson. But in this leading case the operation of reversal was not delayed after the guiding principles of dynamo construction on the large scale were understood and applied satisfactorily in practice. It does not at all follow that mere acquaintance with the principle of reversal will enable anyone to work a process or a machine backwards. It is necessary as a preliminary to this operation that the thing shall be susceptible of action in two opposite senses, and that both uses shall be called for.

One of the best examples of the application of the principle of reversal supplied in gas engineering is the rotary exhauster, which was originally intended for a rotary steam-engine, in which capacity it was a lamentable failure. It is therefore to be included in the category of those reversed machines which are in reality only good for the contrary purpose to that contemplated by their designers, and consequently supply, from one point of view, examples of the fatuity of human plans, or, from another, good illustrations of the indomitable spirit that induces men to make the best of a bad job. A perfect example of the other class of machines—those which work equally well for their intended purpose or reversed—is the well-known but old-fashioned Jones exhauster, which was nothing more nor less than a vertical steam-engine converted for use as a gas-pump. The wet gas-meter, again, is normally a kind of gas-and-water wheel turned by gas. It is quite possible, however, to make it drive the gas instead of being driven by it; and although such motive-power meters, as they are called, are but rarely used now in connection with the supply of gas to consumers, yet the principle is not without utility in connection with the addition of carburetting vapour or oxygen to coal gas in process of manufacture. The station governor acts by virtue of a reversal of the habit of gasholders; and if the coin-controlled consumer's meter is not exactly a "reversal" arrangement except in the point of getting in the money before the gas is burnt, it is at any rate a notable "revival" of an idea which is as old as written history.

This observation suggests another, on the subject of this so-called principle of "reversal" in invention. It can never be other than a second-hand style of advancing mechanical science, so long as it is deliberately chosen as the inventor's guide. In order to successfully reverse anything, the thing must previously exist in fact or upon paper, and he is but a poor sort of inventor who would be content to seek for this road to fame and fortune. Moreover, although there is something rather fascinating about the notion that there may exist many a process and apparatus which has hitherto escaped profitable reversal, because nobody before Mr. Edward P. Thompson has had the luminous idea of formulating "a true solid principle of reversal, and not a theory" whereby men might be laid upon the right track in this regard, there is small hope, we fear, that the kind of inventors who have lacked such guidance will be able to do much with it now they have had it placed at their disposal. Mr. Thompson's key is one that only fits an open door. It is one thing to survey the whole field of physics and mechanical science, and see in some things a reversal of others; and quite another thing to see where reversal would be possible or advantageous. This is one reason why, although the trick of turning things "the other way about" is so obvious, many apparently obvious reversals have been long in the doing. The most striking case in point is the reversal by Dr. Linde—for the

production of intense cold—of the recuperative principle introduced by Mr. Frederick Siemens for the production of intense heat. This remarkable application is only a few months old; while the Siemens furnace was invented nearly forty years ago. Why has this result been so long upon the road? Whoever could answer this question would be very near to understanding what genius is, and would have a better insight into the ways of things in general than is vouchsafed to most people. Again, we all know the trouble of the gas-engine—how it wastes 40 per cent. of its fuel because it cannot make a proper use of the heat which is evolved when the potential energy of the gaseous mixture is converted in the cylinder into dynamic energy. Why, then, we may very well ask, does not somebody "reverse" this state of things, if this principle is truly a key to a real mystery?

These considerations may serve to convince us that Mr. E. P. Thompson was not relinquishing sole rights in a grand secret when he formulated his "principle of reversal," which was in his estimation too "solid" to be a "theory." As a contribution to the armoury of the engineering critic, the suggestion of the lecturer is not to be despised. As an aid to the inventor it is worthless; for where it is anything more than a grandiloquent designation of an old trick of the copyist who would be original, it indicates an operation calling for the same genius to perform successfully as goes to the accomplishment of any original invention.

The Managership of the Perth Gas-Works.—As mentioned by our Scotch correspondent last week, the list of applicants (43 in all) for the position of Manager of the Perth Corporation Gas-Works, rendered vacant by the resignation of Mr. Thomas Whimster, was reduced to nine. At a special meeting of the Gas Commission in Committee on Monday last week, the number was further brought down to three; and eventually the choice fell upon Mr. Andrew Wilson, of Carlisle. As will be seen from our "Notes from Scotland," the selection was confirmed by the Corporation last Thursday. The successful candidate is a son of Mr. Thomas Wilson, of Coatbridge, whose assistant he was before he obtained an appointment under Mr. Hepworth. Although young, he has had varied experience; and, under two such managers as his father and the former Gas and Water Engineer at Carlisle, it must have been of a very excellent character. Moreover, his "record," if we may be pardoned the expression, has been exceptionally good; and therefore we think the Perth Gas Commission will find they have entrusted to the right man the practical supervision of their important undertaking.

Bacteriology and the Quality of Water.—For several years the American Public Health Association have had a Special Committee on the Pollution of Water Supplies. At the meeting of the Association in Montreal, this Committee recommended that a co-operative investigation should be instituted with regard to the bacteriology of water supplies; and, as an outcome of this proposal, a convention was held in New York, in June last, to consider methods, and elaborate a standard scheme of work which would secure some sort of uniformity in the differentiation of species of bacteria. We learn from *Nature* that the subjects considered relate almost exclusively to certain technical matters which required elucidation before a satisfactory scheme of work could be drawn up. Among the questions was the grouping of water bacteria, and the influence of variations in the composition of nutrient gelatine upon their development. No decision was reached on any of the subjects discussed; but they were all referred to a Committee, with the understanding that the convention would accept the decision come to, and that the members would modify their laboratory methods in accordance therewith.

Gas v. Electricity for Traction.—The proposal to construct an electric tramroad between Brighton and Rottingdean does not advance much in public favour; and the Brighton Town Council have given in a very half-hearted fashion their consent to the erection of posts on the seashore. Though the application was originally made for an electric tramroad, it does not seem as if the Company had yet made up their minds as to the system of driving to be employed; and, at the meeting of the Brighton Town Council last Thursday, Mr. Stafford asked Mr. Dawson (the Company's Consulting Electrical Engineer) if he did not think that a gas motor would be cheaper than the trolley system. Mr. Dawson replied emphatically that it would be impracticable. Mr. Stafford put the same question to Mr. A. Wright (the Electrical Engineer in charge of the Company's works). Mr. Wright said there was no doubt a difficulty; but he considered that the use of a gas motor would be the cheapest solution of the difficulty. Such a motor could be worked much more economically than an electric one; and, according to Professor Kennedy, the vibration produced would not be noticeable, and he did not consider that there would be any danger from explosion. He saw no difficulty in applying the system on the scale necessary for the purpose of the Rottingdean railway; and he thought that gas traction would give it a better chance of paying than would be the case with electricity. He must admit, however, that the use of a gas-engine on such a line would be in the nature of an experiment. The point was then left; and, in the end, the Town Council agreed to the scheme for a tramroad.

NOTES.

Proposed Sugar Beet Cultivation in England.

Depression in the agricultural and artificial manure industries is naturally to some extent action and reaction. Among other recent contributions to the discussion of the present deplorable condition of British agriculture may be noticed, on account of its possible bearing upon the demand for sulphate of ammonia, a paper read at the Imperial Institute by Mr. J. Kersley Fowler on the sugar beet, with special reference to its cultivation in the United Kingdom. Mr. Fowler began by showing that it is high time some new departure was taken with the object of making farming profitable. More than twenty-five years ago, Mr. J. Duncan, a sugar refiner, tried the experiment of establishing at Lavenham, in Suffolk, a factory for making sugar from beetroots. The factory was a failure, because the farmers of the neighbourhood could not be induced to grow and deliver enough roots to keep it going. Wheat was then selling for 60s. per quarter, as compared with the present price of 24s. per quarter; and it did not pay to grow sugar beet at £1 per ton. It has been asserted that English climatic conditions are not favourable to the growth of the sugar beet; but this has been disproved by direct experiment and analysis by Dr. Schack-Sommer, of Liverpool. The cost of growing and delivering an acre of sugar beet is about £9 5s.; and as 15 tons per acre could be produced, and the price at present is 17s. per ton, the crop shows a fair profit of £2 10s. per acre. An immense improvement in the quality of the roots has taken place of late years; reducing the weight required to yield a ton of sugar from 12½ to 8½ tons. Co-operation of various interests is needed to establish the industry in the derelict English corn lands.

Discussions upon Argon.

Chemists and physicists everywhere continue to investigate the nature and properties of argon. Signor R. Nasini declares himself to be of the opinion that the monatomic character of argon, as deduced from the kinetic theory of gases, cannot yet be regarded as irrefragably established. In presence of the discrepancy between the conclusions in this regard drawn from the kinetic theory of gases and the periodic system, and so long as more cogent evidences cannot be brought forward, Signor Nasini says he cannot believe that 40 represents the true atomic weight of argon. M. Schlœsing, jun., has confirmed the experimental results that were obtained by Lord Rayleigh and Professor Ramsay, which go to show that argon is not appreciably absorbed by copper or by cupric oxide. Testing for argon in air taken in Paris at a height of about 10 metres above the ground, in air taken in Normandy on the top of a hill about 1000 feet high, again in air collected at a height of 300 metres on the Eiffel Tower, and at the bottom of an iron mine, Schlœsing finds that the proportion of this constituent of the atmosphere varies only to a degree scarcely perceptible on analysis. Argon occurs in air extracted from arable land at different depths in a slightly smaller quantity than in normal air. This is partially explicable by the solvent action of water upon it; always supposing that the rain reaches the soil before it has taken up from the air all the argon which it is capable of dissolving.

Measurement of High Temperatures.

The *Chemiker Zeitung* gives some extracts from a paper on this subject by Herr L. Holborn and Herr W. Wien (*Wied. Ann. Phys. Chem.*, 1895, LVI., 360). There are three methods by which high temperatures may be measured. The first uses an air thermometer of refractory material; the second depends on the change in the resistance of a platinum wire with change in temperature; and the third is based on the employment of a thermocouple of difficultly fusible metals. The air thermometer method was valueless until recently, as suitable vessels could not be made. But now they are produced from some refractory clays, and permit of measurements of temperatures up to 1500° C. (2732° Fahr.). The results are, however, vitiated by the effects of capillarity in the interior of the vessel. The resistance method has some great disadvantages. At high temperatures, the absolute resistance generally increases constantly; but the coefficient of the temperature diminishes very irregularly. The presence of free hydrogen also affects the resistance; and the wire must, therefore, at least be calibrated before and after use. The third or thermopile method has proved the best. The most favourable circuit consists of platinum, and an alloy of platinum with 10 per cent. of rhodium. The increase in the electromotive force of such an element is exactly proportional to the temperature. No substance except carbon affects the constancy of the couple; and temperatures up to 1600° C. (2912° Fahr.) can be measured by it.

Successful Concrete Monolith Construction.

The method of construction of some successful portland cement concrete piers for a lofty railway viaduct has been described by Mr. G. R. Tuska before the American Society of Civil Engineers. The whole of the work was done by men who had never made concrete before. It was composed of one part of cement, two parts of river sand, and five parts of broken limestone, mixed by hand; the barrel of cement being taken as the unit of measure. In the mixing, two barrels of sand were laid out evenly in the mortar-box, and a barrel of cement

spread over it. After having been thoroughly mixed dry, about 12 gallons of water were added; the quantity varying with the freshness of the cement and the temperature. The broken stone was laid down beside the mortar-box in a bed 4 feet wide and 6 inches thick, wetted, and the cement mortar thrown upon it. After being turned over with shovels twice, the concrete was wheeled to the moulds. Here it was laid down in beds 8 to 10 inches thick. By passing the blade of a shovel between the mould and the concrete, a small portion of the mortar was forced against the mould; thereby giving the work a smooth finish with no stones showing at the surface. The concrete was rammed as laid with rammers weighing from 30 lbs. to 40 lbs. Too much ramming is to be avoided. Two days after completion of the pier, the moulds were removed; the new concrete being protected by brushwood from direct rays of the sun, and watered twice every day for a week after the removal of the moulds. This process was found to benefit it greatly. Before commencing work each day, the surface of the old work was roughened with a pick, then cleaned and well wetted, and a layer of cement mortar laid over it to receive the new concrete. One abutment so made contains 321 cubic yards of concrete, and the work has stood perfectly the vicissitudes of hot sunshine and sharp frost. Stone and sand concrete thus made is almost completely waterproof.

The Temperature of Flames.

Professor Hartley has recently been engaged investigating the spectroscopic phenomena presented by flames at high temperatures, with reference to the use of the spectrum as an index of temperature. His observations were made up on the flame of the Bessemer converter, which has been calculated to be above the melting-point of gold, and below that of platinum. When a simple spectrum changes to one of a more complex character, the alteration is due to an increase of temperature, other things being equal. Similarly, when a spectrum extends through the visible rays into the ultra-violet region, and an increase is observed in the number and intensity of the ultra-violet rays, nothing but a rise in temperature will serve to account for the change in the spectrum. Professor Hartley admits the difficulty of ascertaining the maximum temperature of any flame, as such temperature may exist over but a small area; and he observes that Le Chatelier's recent measurements of the temperature of furnaces appear for this reason to have given numbers considerably lower than those usually accepted. Professor Hartley thinks the temperature of the Bessemer flame must in any case nearly approach that of the oxy-hydrogen flame, if it does not generally exceed it. It is curious to remark that, though the temperature of the material in incandescent gas-burners must be high, no spectroscopic observations of these light-sources have yet been published.

COMMUNICATED ARTICLE.

NOTES ON CURRENT TOPICS.

By "Veritas."

Much has been written on the question of incandescent lighting; but there is one special detail which has not been prominently noticed—viz., the amount of material available for the preparation of the "mantles." In cases where comparatively rare elements are used for a specific purpose and some commercial application demands an increased supply, the increased demand is frequently accompanied by a large rise in price. This has been recently exemplified in the case of platinum, the price of which rapidly increased with its extended employment for electrical purposes. In the case of the incandescent burner, the light is to a large extent dependent on the durability of the mantles. These mantles are prepared in a special way from elements which, a few years back, were so rare as to be almost regarded as simply chemical curiosities. In recent years, a practical demand has arisen for these special materials; and the practical application of that which was previously regarded as scarce and rare, has stimulated the discovery of new sources of supply.

With special reference to the production of mantles necessary for the incandescent system of lighting, a publication in the JOURNAL for Oct. 29, giving a *résumé* of a paper read by Dr. Bunte, of Carlsruhe, affords most important details with regard to the supply and cost of the necessary raw materials. It appears that great quantities of a mineral known as monazite—containing from 2 to 4 per cent. of thorium—have been recently discovered in the United States, Brazil, the Ural, and Australia; the amount being so large that an Amsterdam firm undertakes to deliver no less than 20,000 tons on rail at 9 cents per pound. Dr. Bunte estimates that the raw material contains about 3 per cent. of valuable constituents, and that, taking the amount necessary for the preparation of an ordinary mantle at about half a gram, the actual value of the material necessary for the preparation of each mantle is less than one halfpenny. In this estimate, the cost of preparation, and the high professional skill necessary, are ignored; but the fact remains that, with an available commercial supply of 20,000 tons per annum (containing some 600 tons of thorium oxide) and on the basis of each mantle only requiring half a gram of the pure material, we have available a sufficiency of the raw product to produce an annual supply of no less than 1200 million mantles. Dr. Bunte also points out that the system of the employment of a mantle for the development of light need not necessarily be confined to coal gas; and that the method is available for portable lamps burning methylated spirits, benzene, or naphtha. He even goes to the extent of expressing an opinion that the incandescent spirit-lamp will, when improved, undoubtedly come to be a severe competitor with petroleum lamps which are used in country places where ordinary gas is not available.

Dr. Bunte also makes reference to the possible use of acetylene as an illuminating agent. He states that the chemical works at Neuhausen and Bitterfeld have taken up the manufacture of calcium carbide, with the result that the material can now be purchased at 2¾d. per pound. At this price, and considering the high value of acetylene as an illuminant, calcium carbide should in the immediate future take its place as a serious competitor with other sources of light. But the cost of carriage has to be taken into account; and it would possibly be more expedient to supply a compressed or liquefied gas in preference to the raw material. Should acetylene ever be used as an adjunct to existing illuminants, the suggestion which has already been made might be of value—viz., that in cases where dynamos are employed for electric lighting, the surplus power of the machinery, when not devoted to the supply of electricity, might well be used for the production of calcium carbide. Of course, the suggestion is at present outside the domain of practical politics, as there has been as yet no attempt to introduce acetylene on a practical scale for commercial purposes. In ordinary houses supplied by coal gas, and with the possibilities of light capable of development by modern appliances, there seems little need for deserting ordinary gas in favour of acetylene. With regard, however, to remote country districts, where private houses have no public gas supply, and where in some extreme cases some special plant for the production of gas is on the premises, the advent of compressed acetylene as a possible illuminant would be welcomed. The cost and difficulty of gas manufacture, with its attendant retorts, labour, and gasholders, would be dispensed with. The alternative of the use of paraffin lamps, with their inherent dangers, would also be dispensed with. This is, of course, for the present simply ideal, but not without the region of what may be a possibility within a few years' time.

Turning from the question of lighting to that of heating, there is no doubt that one of the most important developments of the use of gas in recent years has been that of its employment for heating purposes. The public are still ignorant of the best means of using gas for this purpose; and it rests in the hands of the gas companies to give the proper directions. Gas is useful in affording a cleanly and efficient source of heat; but it is very unfortunate that there are still firms in existence who advertise stoves which they claim can be used for heating purposes in an ordinary room without a chimney flue. Any material used for heating purposes—whether solid or gaseous—gives off, on combustion, products which are more or less injurious to health, and which ought not to be allowed to escape into the atmosphere of an ordinary room, but should have their natural outlet by the usual chimney. Stoves which are advertised to work without this arrangement act prejudicially to the use of gas for heating purposes. There is a popular misconception that, simply because gas-stoves do not produce visible smoke, the products of combustion are innocuous. This is a very great mistake, as the combustion products from gas, although not accompanied by the obvious smoke produced from an ordinary fire, are more or less injurious. In addition to this, it has to be considered that, although fuel is consumed mainly for heating purposes, whether gaseous or solid, it performs another function, which is too often overlooked—that is the question of ventilation.

Gas burnt in a room simply vitiates the air, but a gas-stove connected to a chimney affords radiant heat and at the same time creates a current of hot air up the chimney—producing a corresponding influx of pure air. The function of the heat of combustion *quoad* ventilation is, in fact, too often neglected; but, of course, in the question of the use of gas as an illuminant, where it is consumed at a comparatively high elevation near the ceiling of the room, the heat developed by combustion could not be used for ventilating purposes without material alterations in existing architectural details. The provision of pipes to act as outlets for combustion products, and consequently as ventilators, would necessitate careful provision so as to prevent dangerous results from over-heating, with the additional disadvantage that outlets of communication to the external air situated at a comparatively high level will frequently, under varying conditions, act in a reverse manner. This is the question which the modern science of ventilation has not completely solved; and yet it is one which in principle is apparently simple. Given a gas-burner at the upper portion of a room, provided with an orifice communicating with the external air, through which the heated products of combustion could escape—admitting also that there is a free inlet for fresh air—we have an ideal system of ventilation acting automatically. The gas, however, is not alight throughout the day, whereas the domestic fire may be actively at work; and in this case a strong current of heated air passes up the chimney, and requiring a corresponding volume of fresh air, enters the room by the channel of least

resistance. In ordinary cases, the fresh air obtains entrance by chinks of doors and windows, but mainly as a cold substratum which, starting from the under surface of the door of the apartment, makes itself painfully evident to the feet of the occupiers of the room, who are frequently seated between the door and the fire, and are thus in the main line of the draught. In the case of gas-ventilated apartments on the lines briefly sketched out, the air-tube provided as an outlet for the heated products of combustion from the gas would—in the event of the gas not being alight, but the fire in use—act as the channel of least resistance for the inlet of cold air; thus reversing the conditions for which it was intended. This has happened in public halls, where a powerful system of central lighting has been adopted with a corresponding system of ventilation.

In considering the use of gas-stoves for heating rooms, the advisability in all cases of ensuring the exit of combustion products by a chimney has been strongly recommended. The ordinary combustion products from gas are carbonic acid, water vapour, and sulphurous oxide; the amount of the latter being dependent on the proportion of sulphur present in the original gas. Whether the gas is used for heating purposes in a stove unattached to a chimney, or whether it is used for pure purposes of illumination, the air of the apartment must be correspondingly vitiated. There is, however, a great difference between the two cases, inasmuch as the proportion of gas used for heating would, as a rule, be much in excess of that required for lighting. Further, gas used for heating purposes is necessarily consumed at a comparatively low level; and therefore the combustion products would tend to vitiate the air at a lower level than when burnt for illuminating purposes closer to the ceiling. It is obvious that, in the former case, the deleterious action on the occupiers of the room would be far greater than in the latter.

When speaking of the products of the combustion of gas, the possibility of the formation of incomplete combustion products has been omitted as on this detail there has not been sufficiently trustworthy evidence to deserve serious comment. At the same time, as a criticism of the whole question as to the possible evolution of incomplete combustion products from ordinary burners, whether of the luminous or non-luminous type, the paper communicated to the JOURNAL for Nov. 19, by Mr. Lewis T. Wright, bearing the title "On the Alleged Escape of Carbonic Oxide and Unconsumed Carbon from Coal Gas Flames," is well worth careful study. Mr. Wright shows that, in spite of allegations to the contrary, the consumption of gas in all forms of ordinary burners is practically perfect—that is to say, that incomplete combustion products, which if present would be markedly deleterious to health, are not formed. Mr. Wright very truly points out (alluding to the methods of investigation which have been adopted by those who allege that unconsumed gas or incomplete combustion products normally pass from ordinary burners) that corresponding tests have not been made of impurities present in the air of the apartment. The suggestion, and a very probable one, is that the results obtained on analysis, and which were credited to unconsumed combustion products, were really and actually due to impurities in the air. Mr. Wright appears to have made a most careful series of experiments with the view of detecting the presence of the incomplete combustion products of gas consumed by the ordinary methods; and, to use his own words: "The results were in all cases negative." He further adds that he does not believe that an instance of imperfect combustion has ever been substantiated against lighting burners, nor even against heating burners of good class when employed under their normal working condition. This is a very satisfactory statement; and it proves that, in the use of gas (whether in the domain of heating or lighting), with a full knowledge of the products of complete combustion, we have learned the worst, and that we need not take alarmist views as to the possibility of the formation of any other substances more deleterious to health.

Obituary.—In the last number of the JOURNAL we had to record the death, on the previous Wednesday, of Mr. W. Thorman, the Engineer of the Lea Bridge District Gas Company. We regret to have to announce to-day another loss in the family. Just a week after the event above alluded to, Mr. John Thorman, brother of the deceased, and the Engineer of the West Ham Gas Company, died after a few hours' illness, in his 49th year. Mr. J. Thorman entered the Company's service in 1868, and was subsequently appointed Assistant-Manager. In 1891, he succeeded his father, the late Mr. E. H. Thorman, in the position now rendered vacant under such peculiarly sad circumstances. The Directors of the Company, many of whom had known Mr. Thorman from boyhood, and who regarded him in the light of a personal friend, held a special meeting last Thursday evening, for the purpose of recording their sense of the loss the Company sustains in his premature decease, and their deep sympathy with Mrs. Thorman and her family in their great bereavement. ——Mr. George Gascoyne, of Derby, who had attained the venerable age of 81 years, died last Wednesday. His name will be familiar to many of our readers in connection with the chairmanship of the Derby Gas Company, which office he held for many years, and only resigned it at a comparatively recent date on account of failing health. He was also Chairman of the old Derby Water Company until the undertaking passed into the hands of the Corporation.

TECHNICAL RECORD.

MANCHESTER DISTRICT INSTITUTION OF GAS ENGINEERS.

Quarterly Meeting in Leeds.

The Quarterly Meeting of the Institution was held last Saturday, at the Great Northern Hotel, Leeds. In the absence, through ill-health, of the President (Mr. George Smedley, of Buxton), the chair was occupied by Mr. ISAAC CARR, of Widnes, the Senior Vice-President. There was a very large attendance of members.

The CHAIRMAN said he was sorry to have to open the meeting with an announcement that the President (Mr. Smedley) was not able to attend on account of ill-health. Unfortunately, for some time past, he had been ailing; and the Committee were afraid he might not be able to be present. That morning, they had received a letter to confirm this; and he supposed, by virtue of being Senior Vice-President, he would have to act in Mr. Smedley's stead that day. He could only say he hoped that Mr. Smedley would soon be restored to health; and that he would be able to attend at the next meeting, and fill his place at the finishing up of his year of office, before the chair was taken by the succeeding President. He (the Chairman) was very pleased to meet the members at Leeds, and to see such an excellent gathering. Another gratifying feature of the meeting was to see so many strangers from many parts of the country, which only showed how happy the Committee had been in selecting Leeds for the meeting. He hoped that this was a good augury for future meetings in the city. As a rule, the Committee had arranged for one meeting in some part of Yorkshire; but he could not remember coming to Leeds before, although he had been connected with the Institution for a great number of years. He was quite sure that, after such a gathering as this, they would not be very long before they again visited Leeds.

CONFIRMATION OF MINUTES.

The HON. SECRETARY (Mr. S. S. Mellor, of Northwich) read the minutes of the meeting held at Buxton in August last; and they were confirmed.

NEW MEMBERS.

The following gentlemen were elected members of the Institution; Mr. W. Higginson, of Sandbach; Mr. J. Nicholson, of Castleford; Mr. E. O. Watson, of Rawmarsh; Mr. R. H. Nuttall, of Milnrow; and Mr. A. H. Smith, of Darwen.

ELECTION OF PRESIDENT FOR 1896.

Mr. C. A. CRAVEN (Dewsbury) said, before moving the resolution which had been confided to him, he would remark that, as a Yorkshire member of the Institution, and particularly as a Yorkshireman, he hailed with satisfaction the advent of the Institution to the busy city of Leeds. He was only sorry that they had not a good "figure-head" in the city. They could then have rallied round the Institution, and given the members a good reception. But the officials in Leeds were sadly split up. He was not going to offer any opinion on this point—whether it was for the good of the city or otherwise. However, all the Yorkshire members were very pleased to meet their fellow-members, and to extend to them the "right hand of fellowship" on this occasion. In moving his resolution, he was going to place before the members the name of Mr. Isaac Carr as President for 1896. He thought the suggestion of the Committee was certainly a very happy one. His recollection of Mr. Carr dated back to 1876 or 1877, since which time he had mounted up, and made his mark. He had always taken an original view of matters; and he (Mr. Craven) thought that, on the whole, he had come out in an extremely satisfactory way from the things that some people were inclined to carp at. He had great satisfaction in moving his election.

Mr. J. F. BROMLEY (Batley) remarked that in Mr. Carr the Institution would have a President who had not only a considerable amount of natural, but much acquired ability; and he had great pleasure in seconding his nomination.

The motion was heartily agreed to.

The CHAIRMAN said he was exceedingly obliged to the members for the honour they had conferred upon him in electing him to be their President for the coming year. He should do his best to forward the interests of the Institution, as he had ever done since he became a member thirteen years ago. But a President could do very little himself. He might be enthusiastic, and might work hard; but unless he had the cordial support of the members, there was little hope for the welfare and success of the Institution. The papers and discussions had not, to his mind, been of late up to the standard that they used to be; and he urged upon the members to come forward, and take a deeper interest in the work.

Mr. WILLIAM NEWBIGGING then read the following paper:—

TOWER SCRUBBERS AND HORIZONTAL OR WASHER-SCRUBBERS.

One of the tendencies of recent years among gas managers is that of dispensing entirely with the tower scrubber, and placing reliance on one or other of the various forms of horizontal or washer-scrubbers for eliminating the ammonia

impurity from the gas. The objection raised against the tower scrubber is that it fails in its primary duty—viz., that of the removal of the ammonia impurity. It is with a feeling of regret that I am forced to the conclusion that in many cases the charge is true. Of all the apparatus on a gas-works, the tower scrubber has, perhaps, the most pleasing, or at least imposing, appearance; but if it has still to retain its place among modern gas-works appliances, good reasons must be forthcoming for its retention—efficiency before appearance being the cry, and rightly so.

The usual and proper custom in gas-works where tower scrubbers are erected in pairs, is to put weak ammoniacal liquor from the hydraulic main and the condensers through the first, and clean water through the second vessel. The weak liquor, having a strong affinity for carbonic acid and sulphuretted hydrogen, materially lessens the work of the purifiers by extracting a proportion of these impurities, in addition to bringing the liquor up to the requisite commercial strength. The second scrubber, through which clean water passes, removes the last traces of ammonia remaining in the gas.

This is the view we have always had of the action that takes place; and theoretically it is correct. But as practical men, we know well that an apparatus that will so effectually distribute the liquor, or the water, as the case may be, in such a manner that the whole of the surfaces exposed to the gas in its passage shall be evenly wetted, has yet to be invented. The water often finds its way into one channel, while the gas is passing round and about it, but untouched by the falling water. Especially is this the case where tower scrubbers are filled with coke. The wood boards, though far from perfect, were a step in the right direction, as also are the canvas screens; but whether coke, or wood, or canvas screens, in a scrubber which exceeds 9 feet in diameter it is impossible to ensure efficient and equal water distribution. This is, of course, as much due to imperfections in the distributor as in the filling material; and so the ammonia passes forward, to the injury of the consumers' fittings, and a consequently smaller amount standing in the books to the credit of the liquor. More especially is this the case where reliance is placed on a single tower scrubber.

Now, while deprecating the entire abolition of the tower scrubber, the advent of the washer-scrubber has necessitated an alteration in the usual arrangement and functions of the tower. When erecting a new plant, I would recommend that one tower scrubber only be provided, to be worked in conjunction with a washer-scrubber. The arrangement would be as shown in the following diagram:—

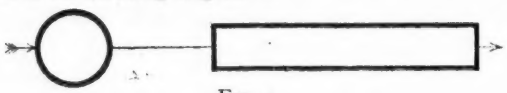

Fig. 1.

Weak ammoniacal liquor is passed through the tower scrubber and clean water through the washer-scrubber. The tower scrubber will remove a large proportion of the ammonia and other impurities, and is useful for the purpose of working up the liquor to the requisite strength; while the washer-scrubber will remove the last vestige of the ammonia from the crude gas.

Where there are already two tower scrubbers in existence, I should arrange them as shown in the second diagram; passing weak liquor through the tower scrubbers, and clean water through the washer-scrubber:—

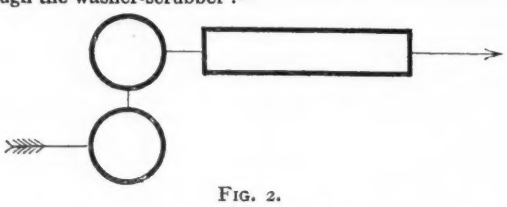

Fig. 2.

When the make of gas has increased to such an extent that still further scrubbing power is required, a second washer-scrubber should be added; and the arrangement would then be as shown in Diagram No. 3.

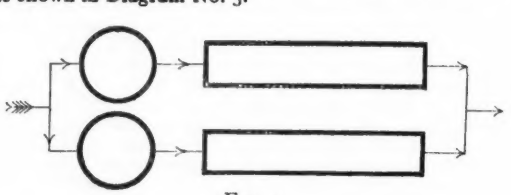

Fig. 3.

Whichever of the two forms of apparatus be used, it is indispensable for their efficient action that the tar should be removed from the gas previous to its entering same. However efficient a condenser may be, it leaves much of the lighter tars untouched; and these go forward, to the detriment of the efficient working of the scrubbers, and also to the injury of the gas. Take an extreme case: Assume the scrubber to be largely impregnated with tar, and the gas passed through it in the ordinary way, the illuminating power of the gas would suffer materially. For that reason, a tar-extractor should be fixed at the bottom of every tower scrubber to do this work, which more often than not is left to the scrubbers themselves—a duty which they were not constructed to fulfil.

There are various forms of washer-scrubbers in the market and many managers are in doubt which to adopt. Each maker naturally claims his own as the best; and only actual and varied experience under different conditions will determine that point. The persuasive eloquence of a good traveller has found a place for apparatus in many a gas-works, which, for all the use it is, might as well never have been fixed. On the other hand, there are machines by various makers which work steadily the 24 hours round, requiring little attention, and removing all traces of the ammonia impurity. As regards cost, there is not much difference between the tower scrubber and the washer-scrubber. The latter is more easily protected than the former against the frost and snow in winter and the rain and sun in summer, as a light shed can be erected over it; whereas a tower scrubber is exposed to all weathers, and consequent wide variations in temperature. Being nearer to the ground, a washer-scrubber is also more under the control of the foreman, who, if an elderly man, or one possessed of weak nerves, hesitates to climb to the top of a tower. The manager, also, can more easily ascertain whether the apparatus is fulfilling its functions. He arranges the flow of water in such a way that he always has several of the compartments clean; knowing thereby how much power he has in reserve.

In conclusion, I would say that experience has taught me that a combination of the two forms of apparatus, in the way I have shown, is the best.

Discussion.

The Chairman said a feature of Mr. Newbigging's paper was that he took a different line from the one usually followed, in recommending that the tower scrubber should take the second place to the purifying-machine, or mechanical washer-scrubber, in the order of the flow of the gas. He did not agree with the conclusions that Mr. Newbigging came to, inasmuch as, at the present time, he was working two large tower scrubbers, and should have a mechanical scrubber for sale very shortly (laughter). His object in working tower scrubbers in preference to mechanical washers was that it was essential, in purifying gas from ammonia, that the flow of gas through the vessel should be as slow as possible; it afforded facilities for doing something else besides extracting the whole of the ammonia. Of course, the gas contained a good deal of ammonia, in the form of cyanogen, that was never recovered; and in tower scrubbers it was possible to decompose the cyanogen. By putting in a little alkali with the water over the scrubber, the alkali combined with the cyanides, and broke them up; and the nitrogen of the cyanides combined with the nascent hydrogen in the gas, and formed ammonia, thus increasing its yield. This was a thing he could not speak upon with any special data at the present moment. But it was a reaction that did absolutely take place in the tower scrubber; and besides it was one that could only be obtained by giving prolonged contact between the gas and the water or the soda solution. Whether at present the decomposition of these cyanides paid for the cost of the soda, he was not yet prepared to say; but he believed it did. At all events, there was a great deal to be hoped for in the way of increasing the yield of ammonia from the gas. With coal containing 1½ per cent. of nitrogen—that was, calculating it out, equal to 140 lbs. of sulphate of ammonia per ton of coal—they considered they were getting a large yield if they obtained 27 or 28 lbs. of sulphate. All this nitrogen went away in some manner. Some was broken up in the retort, and some went down as ammonia; but a large quantity went away as cyanide. He considered that a large tower scrubber was the most suitable apparatus for the recovery of the cyanides; and if they were to be got and sold commercially, it could not be done by rapid contact through a purifying-machine. This was the reason he was discarding his mechanical washers, and going back to the old tower scrubbers of large capacity.

Mr. William Carr (Altrincham) felt very much disappointed with the paper. He thought that they should have had some statement or some argument put before them, either that the tower scrubber or the washer-scrubber was the best. Here they were fronting "north by south"—a combination of both was best. However, he was much obliged to Mr. Newbigging for having brought forward the paper. It reminded him of the one read by the late Mr. Ogden at one of the Institution meetings in Manchester, on which occasion he thought the best discussion was heard that had ever taken place on the question of scrubbing and washing. The matter was then fairly threshed out, as they thought. They came to the conclusion most decidedly that the tower scrubber possessed advantages which the washer or horizontal scrubber did not. Mr. Newbigging had pointed out some objection to the tower scrubber, as to its height and the difficulty of protecting it, and also the fact that, in consequence of being filled with improper material, it was very frequently inefficient, and passed gas without taking out the ammonia. This, to his (Mr. Carr's) mind, all came from the want of intelligent use of the tower scrubber. Mr. Newbigging said the filling of the scrubbers with boards was a step in the right direction; and

he agreed with him that it had only been a step—not because the boards were defective in any shape or form, but because gas engineers had never attempted to solve the question as to how near or how far apart the boards should be. Of course, in the past—say, fifteen years ago—there were not so many gas managers who were also sulphate makers; and it was then an important consideration to sell liquor of high strength. In those days, the liquor in the North of England was sold under Twaddel's hydrometer; and the more carbonic acid and sulphuretted hydrogen they could cram into the liquor, the more they realized for it—they were really selling carbonic acid and sulphuretted hydrogen for ammonia. In some places, when high tower scrubbers were first adopted—he remembered notably the case of Elland, where they had two high towers, which were very much in excess of the requirements of the works—they sold a large amount of liquor in comparison with other works. To a gas manager of that time it must have been a desirable thing to do. As so many purchased liquor by the Twaddel hydrometer, the more stuff gas managers could put into it, to get the hydrometer well up in the liquor, the better it was for them. The people who bought the liquor got alive to this, and commenced to buy it by the ounce and by the distillation test. Then came the process of gas-works putting down sulphate plants of their own. There was no particular advantage in then loading the liquor up, because they had to deal with the sulphuretted hydrogen themselves after it left the liquor; and so the question had grown a little complicated since that time—the advantages of the tower scrubber being lessened thereby. They had had long discussions in that and other Institutions as to the desirability of the purification of gas in closed vessels; and many attempts had been made to purify gas with the liquor, and to absolutely do away altogether with the need of purification by lime or oxide. To his mind, this had always been a possibility; and he still thought it was possible that such a thing might be done. Mr. Livesey, under his purifying liquor process, had accomplished a great deal in the tower scrubber in removing large quantities of impurities from the gas. The celebrated Claus process came next; and it bid fair to get them out of all their difficulties. He remembered when his brother and himself went to Birmingham to see the experimental Claus plant there, which was working in a most efficient way, so they were told by the Engineer who had it in charge and by the representative of Mr. Claus. They had the privilege of testing the gas that was being worked by it; and, so far as they could ascertain, the gas was absolutely purified. Why the process never got beyond the experimental stage at the Windsor Street gas-works at Birmingham, he was never able to see. But since that time there had been a trial on a large scale at Belfast; and it had been given up there. He remembered the discussion that took place at The Gas Institute on this question, on which occasion he said that the only difficulty he could see in the way of such a process was the mechanical appliances that were necessary to work the liquor over the different towers. It was then proposed by Mr. Claus that duplicate pumps should be obtained, so that one could always be ready in case the other went wrong. But he suggested that one might go wrong; and on the other being put to work, that also might go wrong before the first one was again ready for work. Mr. C. E. Jones had ridiculed him at that meeting, and said it was not the habit of gas engineers to let their plant get into such a condition that the moment it was started it broke down. Still, he (Mr. Carr) did not know the reason for the failure of the process. It all pointed to the fact that there was the possibility of more being done with the scrubber or scrubbers than was being accomplished now. They were at present satisfied to take out the free ammonia wherever scrubbers were at work; but he believed that some attempt had been made by Messrs. Davis and Belton to try to split up the cyanides as his brother (the Chairman) had suggested. What would be the result of this process he was not in a position to say; but he would press upon all managers who had to deal with the question that the scrubbing and washing of gas was about the least interesting of any part of gas manufacture at the present time. It was the subject that had received least attention, and yet it was one of the most important in connection with the gas industry. With regard to the filling of tower scrubbers—and therein was the secret—coke, boulder stones, and screens had been used. He had been in a gas-works where he had seen a man splitting up old packing-cases with which to fill the scrubber. The packing-case had come over the Atlantic Ocean, and the boards of which it was composed were an inch thick. The man was using strips of these boards to keep them apart; and so in his scrubber he was having inch interstices between the boards. A man doing this showed his absolute want of knowledge in regard to the real principles of scrubbing. As his brother had already intimated, what they wanted was length of contact, and to ensure contact. Notwithstanding the fact that the gas might be a long time passing through the scrubber, if it did not come in contact with the interfilling material, it might as well go through a plain pipe or an empty scrubber. Gentlemen who had given any attention to the subject of the flow of gas would know that it was fastest away from the surface or where there was no friction. If they had boards that were one inch apart, it would be found that about seven-eighths of the gas passed up the centre of the aperture; whereas only one-eighth dragged along the surface. An ideal scrubber would be one in which they had sufficient area in diameter, and in which they had boards ½ inch apart. With a scrubber containing boards ⅛ inch in thickness and ½ inch apart, they would require nothing more than a good distributing apparatus at the top. This, he agreed with Mr. Newbigging, was a thing that was very difficult to get, particularly for large diameter scrubbers. Of course, if they were only going to use ammoniacal liquor for the scrubber, they could have a splash-plate, and send the gas at great force through the plate. Then the difficulty arose of getting an equal distribution for a scrubber that was something like 9 or 12 feet in diameter. His personal experience was that he had found as much difficulty in getting the distribution of the water in a mechanical or horizontal washer as he had in a tower scrubber. He was bound to say, although he had been able to get the gas clean with mechanical washers, that he had never been able to do much more than take out the free ammonia. With a washer 15 feet long, filled half way up to the centre, and with the upper surface curved and filled with machinery, the gas could not be very long in its passage through. Consequently, the usefulness of the apparatus was very greatly mitigated by that circumstance. In the case of the tower scrubber, if they would only take out the tar, he thought they could get far more efficiency with one scrubber than with half-a-dozen washers. If they had length of contact, the two articles or substances—the water and the gas—came together for such a long time, in the slow passage of the water down the boards (if they had sufficient boards near together), that the gas might be washed to an extent that had been scarcely dreamt of up to the present time. He did not know all efforts for using purified liquor had been given up. He believed a new patent had been taken out lately, and probably they would hear something more of it. There was one point with reference to the tar that Mr. Newbigging had mentioned—as to reducing the illuminating power of the gas. It reminded him of a circumstance that came under his notice in his early days as a gas manufacturer, where a number of tower scrubbers were ranged together, and where the liquor was pumped over in the form he had mentioned—namely, by a splash-plate. One of the foremen, when he found that the illuminating power of the gas was getting too low, used to lower the suction-pipe down into the tar, and pump tar over the scrubbers, with the effect that the illuminating power was increased as much as 1½ candles. The mechanical action of driving the tar against the splash-plate must have had the effect of vaporizing some of the tar; he could only explain it in that way. But the fact was certainly correct, that it did increase the illuminating power by 1½ candles. It was only in cases of passing gas through tar of great density that there was any considerable reduction of illuminating power. He did not know what kind of tar Mr. Newbigging alluded to; but he (Mr. Carr) did not think any tar that reached the scrubbers would have the effect he stated. Although he had spoken on the paper rather against its tenor, at the same time he was much obliged to Mr. Newbigging for having read it; and he hoped it would lead to the further consideration of the scrubbing question by the members.

Mr. W. W. Hutchinson (Barnsley) said there was one point that Mr. Newbigging had omitted in his paper. He might have said something as to the advantage of dealing with the tower scrubbers with a liquor of a certain density in one, so as to get a high strength of liquor, and a liquor of lower quality in the others. He fancied this was one way in which great advantage might be derived. For the reason that it had not been convenient yet, he had not done much in this way himself. But he had, in times past, heard of members who had been working in this direction; and he should like to have their experience. He had himself found some difficulty with tower scrubbers in keeping the illuminating power in good order in their new works at Barnsley. Frequently, in the winter, he had to shut off one or two of them, on account of the extreme cold prevailing having a detrimental effect on the illuminating power. He really rose for the purpose of asking for information with regard to using a separate tank and a separate pump for liquor of varying densities for each tower scrubber.

Mr. T. Bower (West Hartlepool) said at one part of his career he was very much in favour of tower scrubbers; but some seven or eight years ago, he veered round rather towards mechanical scrubbers. At the works with which he was now connected, he put in a mechanical scrubber in addition to two tower scrubbers, 45 feet high by 10 feet in diameter. He did not get the advantage that he hoped to do from the introduction of mechanical scrubbing. Shortly after, when he was considering the rearrangement of some of the plant, he made up his mind that it was desirable to get another tower scrubber. He put up one of the same size and capacity as the two he had previously, with the result that he procured considerable relief. He was not in a position to say that it increased his illuminating power to any great extent; but, on the other hand, it did increase the quantity of sulphate of ammonia he obtained per ton of coal carbonized. There was another point in which he found they were materially helped; and this had been referred to by Mr. Carr. He pointed out that in former days it was not so necessary for gas managers to consider the extraction of sulphuretted hydrogen by their scrubbers as it was now, when chemical manufacturers looked very minutely into the percentage of the ammonia contained in the liquor. In his own case, this did not apply, because the more

sulphuretted hydrogen he could extract by the tower scrubber, in addition to the extra quantity of ammonia, was really a double advantage, inasmuch as he manufactured his own sulphate. In connection with the sulphate plant, he had the Claus plant. So that, if he could extract a large amount of sulphuretted hydrogen in the scrubber, he relieved the purifier of that duty; and in carrying the sulphuretted hydrogen forward to his sulphate plant, he could extract the sulphur in a commercial form, whereas otherwise it would be lost. So far as the financial view was concerned, in this respect he found tower scrubbers to be a great advantage; and if he were called upon now to design an entirely new works, he certainly should lean towards an excess of scrubbing power rather than mechanical horizontal washers. When he was in Lancashire, he had a somewhat similar experience with regard to tower scrubbers. On the introduction of an additional tower scrubber there, he immediately found he had a considerably greater quantity of liquor than before. In Durham, they were not accustomed to get by any means the proportion of sulphate per ton of coal used that gas managers in Lancashire did. They were satisfied with 23, 24, and 25 lbs. of sulphate per ton of coal; and they thought these were excellent results. He mentioned this because, in making comparisons between gas-works in Lancashire and Durham, those in the latter county were often placed at a disadvantage. Anyone who had had experience of Durham, Lancashire, and Yorkshire coal would know that Lancashire and Yorkshire coal contained a larger proportion of ammonia than Durham coal.

Mr. C. A. Craven (Dewsbury) agreed very much with the author of the paper. He had had a tower scrubber, which was quite large enough to deal with all the gas they made up to a certain point; but he never found the scrubber to completely free the gas from ammonia. He was always able to get an ammonia test even in the summer time, when the make of gas was only a quarter (and even less) what it was in the winter. Some years ago, they put up a mechanical scrubber; and he could speak very favourably as to the results. They had no difficulty at all in clearing the gas from all traces of ammonia. That was his experience. He took exception to one remark made by Mr. William Carr. He seemed to think that, when boards were placed in scrubbers, they were put in in a vertical way, so that the gas could follow the same current from the bottom to the top. That was not the way he (Mr. Craven) had been in the habit of having them arranged. The boards he used were 7½ inches deep and ¼ inch in thickness. These were crossed, so that the gas was bound to be broken up; and the breaking up caused it to impinge on the sides of the wetted boards. With regard to the quantity of ammonia, he did not think he had much ground for grumbling. He obtained and sold, on the average, 30 lbs. of sulphate per ton of coal.

Mr. William Carr said he did not dream anybody would misunderstand him in the way Mr. Craven had done in regard to the placing of the boards. He assumed it was one of the elementary principles of filling scrubbers that the boards should be crossed. But if they had boards 1 inch apart, and they were crossed by others 1 inch apart, they would have a vertical column of 1 inch; if they were ½ inch apart, they would have a vertical column of ½ inch.

Mr. C. E. Jones (Chesterfield) agreed with Mr. Carr that inch boards for scrubbers were a mistake, and crossing them at right angles was also a mistake. The practice of filling scrubbers had been a very varying one. In the olden days, some 23 or 25 years ago, the finishing scrubber was packed with broken pots, earthenware, pieces of brick, and other unconsidered trifles of that description. Many years ago, he was an advocate for drain-pipes, which were a great improvement over the rubbish that was put in formerly. Eventually, he adopted this plan in the finishing scrubber: He had boards ⅜ inch in thickness, and 7 inches deep; and he distanced them a little less than ⅜ inch. After the first layer was put in, the next layer was crossed—not at right angles, but at angles of something like 45°. The layers were crossed in the same fashion right to the top of the scrubber; so the gas in passing through would describe a spiral motion, would get broken up, and the bulk of it, in some part of its journey, would come in contact with the wetted surfaces of the boards. This scrubber had been most efficient and effective ever since it was constructed; and, except for painting, it had never cost anything for repair. The distribution was effected by means of a brush distributor. The water supply was conveyed into a tank with a ball tap, which fed another tank; and the filtration was effected by means of sponges, so that if the water contained anything likely to stop the pipes, the obstruction would be arrested. As to the question of maintaining the efficiency of the scrubber in cold weather, he had a coil of steam-pipes passing round inside the scrubber boxes. This was an advantage in the winter, as they never had any deterioration or lowering of the illuminating power, because the temperature of the scrubber could be actually increased to a greater degree than it was at the inlet or the outlet. Mr. Newbigging had shown the importance of removing the tar before it entered the finishing scrubber. He (Mr. Jones) agreed that this was most essential; but he did not agree that the washing of the gas with tar had no ill effect on the illuminating power of very rich gas. He had an opinion that it would be to the advantage of the gas industry if every tower scrubber were doubled in diameter, so that the gas would pass through them at a slower velocity. It would expand itself—it would be in a very attenuated form; and it would be in a condition more favourable for being acted upon by the liquor, whether weak or strong ammoniacal liquor, or water. This additional increase of diameter he considered far more important than an increase in height. No doubt, from the purely chemical point of view, it was a long continuous contact with every particle of gas possible that they had to aim at. When they could effect this, he thought they would have brought tower scrubbers to a perfect condition. He had no ammonia in his gas at the outlet of the scrubber either in summer and winter; and he therefore concluded that the machine he had adopted for the removal of the ammonia was an efficient one. There was one other point that might be considered—that the rougher the board or material that created the scrubbing action, the better would be the efficiency of the machine. He had heard it suggested that smooth iron should be used in place of boards; but this would be a mistake, because the gas would slide so easily over the smooth surface, which it could not do over the rougher surface of the boards. If he were to re-charge the scrubber to which he had referred, he should feel disposed to put in thinner boards, and also to narrow the apertures to such an extent as to avoid any indication of back-pressure. He would strongly recommend those managers who had not adopted boards to do so. Like everything else in a gas-works, they could not scrub and purify gas by chance. The old rule-of-thumb days had passed away; and they must ensure constant and personal attention in order to remove the ammonia from the gas.

The Chairman said Mr. Ford, of Stockton-on-Tees, had honoured them with his presence that day. He had no tower scrubbers on his works; but if he were to tell his experience of working without them, they would be much obliged.

Mr. W. Ford, in complying, said his experience of washers for the last twenty years, with the absence of tower scrubbers, had not been without some amount of trouble and anxiety. He must say this, that mechanical washers, where they had a man equal to a chemist to attend to them, were most perfect mechanical appliances; without such observation and knowledge, he must say that washers were more likely to contaminate than do good to the purification of the gas. In the event of frost, by simply closing up the dampers in the condensers they could very easily regulate the temperature of the gas. He should not like to follow Mr. Jones in his introduction of the steam-pipe. His experience had been that, when ammoniacal liquor was heated up, it caused it to evolve, and so waste, ammonia. After a very long series of experiments and practical experience with washers, he had come to the conclusion that the only way to obtain satisfactory results was by either one or two mechanical washers and afterwards a tower scrubber—reversing the order of the method Mr. Newbigging had adopted.

Mr. Newbigging, in reply, said he was indebted to the various speakers for their contributions to the matter under discussion. The Chairman, in his speech, rather gave the impression that he (Mr. Newbigging) was holding a brief entirely on behalf of the washer-scrubber. He would refer him to the first portion of his paper, in which he stated that one of the tendencies of recent years was to put in washer-scrubbers, and to dispense altogether with tower scrubbers. He read the paper with a view to showing that he considered it better to combine the two appliances in the order shown. Mr. Carr's experience with washer-scrubbers, seeing that he was going to remove one, must have been very unfavourable indeed; and he must have made an unfortunate choice when adopting the machine. If he remembered rightly, at the Widnes Gas-Works they had only a Livesey washer or a tar-extractor. (Mr. Carr: A purifying-machine.) Then he could only repeat that, according to his own showing, he must have made an unfortunate choice. Mr. William Carr had remarked that no portion of the apparatus of a gas-works was so little known as the scrubber. He agreed with him. There was a great difference between the duty which could be obtained from an apparatus that was carefully watched and its actions tested, and an apparatus that was allowed to pursue "the even tenor of its way," without anyone troubling to see what it was doing. To obtain the maximum duty from any apparatus well repaid a manager for the time and trouble it necessarily required. Mr. Carr also claimed that the tower scrubber was more effective than the washer-scrubber in removing other impurities than ammonia. On that point there was much room for difference of opinion. He did not think that anything had been said to alter the opinion he had expressed in the paper. Given a gas free from tar, a copious supply of liquor through the tower scrubber, a measured quantity of clean water through the washer-scrubber, and proper attention to the apparatus, and the best results would be attained.

Mr. S. R. Ogden (Blackburn) next read a paper upon

THE INSTALLATION OF CARBURETTED WATER GAS AT BLACKBURN.

Having been requested by the Committee to read a paper at this meeting, I have with some misgivings decided to give you an account of our installation of carburetted water gas at Blackburn. I cannot, however, go forward without first recalling the very able, interesting, and instructive paper read before our parent Institute some eighteen months ago by Mr. Stelfox,

of Belfast, which gave gas engineers generally an insight into the workings of a carburetted water-gas plant, and of its utility in connection with gas manufacture. To those placed in a similar position to Mr. Stelfox, however, the paper was doubly acceptable; and the manner in which the subject has been taken up, and the number of engineers who have followed his example, will not only be gratifying, but will also repay him for the trouble he took in preparing that paper, and thus bringing the subject forward.

The works at Blackburn were at that time run very much beyond their normal capacity. It had been found necessary to apply to the Local Government Board for sanction to build new works in another part of the town; and a grant of £150,000 had been obtained for the purpose. My Committee were, however, very much averse to increase our already large capital account, if it could be in any way avoided. The advent of the above paper was, therefore, most opportune to us. On approaching my Chairman and Committee upon the matter, it was decided, after further information had been obtained and considered, to put down a plant; and an order was placed with the Economical Gas Apparatus Construction Company, Limited, for two sets of plant on their Merrifield-Westcott-Pearson style of setting.

The question of where to erect the plant was the next point to be decided. After due consideration of the plant and its necessities, it was decided to erect same in an old retort-house on our No. 2 works which contained 112 small retorts capable of producing about half a million cubic feet of gas per day, this house being in close proximity to our coke-store.

The agreement made with the Contractors was, in effect, that the two plants should be capable of producing together not less than 1,250,000 cubic feet of gas per 24 hours, and that 1000 cubic feet of 22-candle power gas should be produced with not more than 50 lbs. of coke nor more than 4 gallons of oil—the quantity to be taken, after purification, by a station meter provided, and the quality tested on a bar photometer. They were also required to provide security for the due completion of the above conditions, the terms of which were very stringent.

The plant to be erected by the Contractors consisted of duplicate generators, carburettors and superheaters combined, washers, engines and blowers, and oil-feed pumps, together with scrubber, condensers, oil-meters, gauges, steam-pipes, steam and water valves, large water-cooled valves, oil superheaters, and all other pipes necessary for the completion of the plant. Also an iron stage or working floor with a hydraulic lift for elevating the coke, &c. The Corporation provided all the buildings and foundations, the boiler, exhauster, meter, purifiers, relief holder, and the storage and service oil-tanks, together with all mains required for the plant. The Contractors were also under a heavy penalty for its due completion ready for working on or before Sept. 1, 1895.

The work was commenced by the Corporation on our works on the 1st of March; and so energetically did the Contractors work to fulfil their part of the contract, that we were enabled to complete the whole, and make the first run of gas, on the 1st of August. It is to their credit that we have not had a single cause for stoppage since the plant was finished. You will have noticed that the above plant differs from that previously described to you, in that the carburettor and superheater are combined in one vessel one above the other—an arrangement claimed by the Contractors to have greater efficiency.

Having given a rough outline of the installation, I have thought it superfluous to attempt any further details either of the plant or of the method of working; and I propose now to put before you some of the working trials and results. The oil used is that known as the Russian "Solar distillate," having a specific gravity of ·875, and a flashing-point of 170° Fahr. After working about three weeks in short runs of a few hours per day when circumstances would allow, it was decided to make a full two days' run, and test the machine for its capabilities. The results were as follows:—

Commenced gas making at 8.30 a.m., Aug. 22, 1895.
Concluded " " 8.30 a.m., " 24 "
Duration of run, 48 hours.

Gas made	1,352,000 cub. ft.
Oil used	4,938 gallons.
" per 1000 cubic feet of gas made	3·65 "
Coke used in generators	39,015 lbs.
" " per 1000 cubic feet	28·85 "
" boilers	14,560 "
" " per 1000 cubic feet	10·76 "
Water used	100,000 gallons.
" per 1000 cubic feet	73·90 "
Illuminating power	21·45 candles.
" per gallon of oil used	5·87 "

Cost of Manufacture.

Oil used, 4938 gallons, at 3¾d. per gallon	£74 11 8½
Coke used, 23 tons 11 cwt. 1 qr., at 6s. 8d. per ton	7 19 5
Labour (manufacture)	3 13 4
Total	£86 4 5½
Cost per 1000 cubic feet made	1s. 3·30d.
Water	0 0·44
Purification (estimated)	0 0·25
Oil, waste, wear and tear (estimated)	0 0·25
Total	1s. 4·24d.

This test was made to ascertain the conditions under which the machine was working, as, having only run such short times, it had been impossible to find out the proper heat by which to thoroughly "crack" the oil to produce the best results. It will, however, be gathered from the results shown that there would be no difficulty in the Contractors fulfilling their agreement.

Owing to the small consumption of gas at that season of the year, it was again necessary to make only short runs each day, so that storage room could be obtained for another test. This was eventually made, as follows:—

Commenced working plant at 8 a.m., Aug. 27.
Stopped " " 8 a.m., " 28.
Duration of run, 24 hours.

Gas made	637,000 cub. ft.
Oil used	2,375 gallons.
" per 1000 cubic feet	3·72 "
Coke used in generators	21,252 lbs.
" " per 1000 cubic feet	33·3 "
Illuminating power	19·1 candles.
" per gallon of oil used	5·13 "

This run was also made for a similar purpose to the previous one, and not with the expectation of any better results. As will be seen, they were much inferior. From this time forward, we were able to run a few hours longer each day; and the progress made was much more satisfactory.

The third and last test made before the expiration of the six weeks required by the agreement with the Contractors to work the plant and instruct the Corporation servants how to control it, was on Sept. 30; and it resulted as follows:—

Commenced gas making at 8.30 a.m., Sept. 30.
Concluded " " 8.30 a.m., Oct. 1.
Duration of run, 24 hours.

Gas made	821,000 cub. ft.
Oil used	2,734 gallons.
" per 1000 cubic feet	3·33 "
Coke used in generators	25,312 lbs.
" " per 1000 cubic feet	30·8 "
" boilers	5,040 "
" " per 1000 cubic feet	6·1 "
Water used	59,000 gallons.
Illuminating power	23·31 candles.
" per gallon of oil used	7·00 "

Cost of Manufacture.

Oil used, 2734 gallons, at 3¾d. per gallon	£41 5 10¾
Coke used, 13 tons 11 cwt., at 6s. 8d. per ton	4 10 4
Labour (manufacture)	1 16 8
Total	£47 12 10¾
Cost per 1000 cubic feet made	1s. 1·92d.
Water	0 0·43
Purification (estimated)	0 0·25
Oil, waste, wear and tear (estimated)	0 0·50
Total	1s. 3·10d.

The result of this trial was considered sufficiently good; and the Contractors having carried out the whole of the conditions enumerated in their agreement, a certificate was given to this effect, and they were duly released of their bond of security, and the Corporation took over the plant. This has been kept working, as necessity required, since that time. These results, I am pleased to say, have been kept up; and, for the purpose of substantiation, I append records of three recent weeks' work—the first and third being part weeks, and the second a full week's working. They are as follows:—

I.—*From Oct. 23 to and including Oct. 30.*

Gas made	4,680,000 cub. ft.
Oil used	15,364 gallons.
" per 1000 cubic feet	3·28 "
Coke used (generators and boilers)	170,268 lbs.
" " " per 1000 c.f.	36·38 "
Water used	204,000 gallons.
Illuminating power	22·90 candles.

Cost of Manufacture.

Oil used, 15,364 gallons, at 3¾d. per gallon	£232 1 2½
Coke used, 76 tons 0 cwt. 1 qr., at 6s. 8d. per ton	25 6 9
Water used, 204,000 gallons, at 6d. per 1000 gallons	5 2 0
Wages (manufacture and purification)	16 7 9
Wear and tear, oil, waste, &c. (estimated)	9 15 0
Total	£288 12 8½
Cost of oil per 1000 cubic feet	11·90d.
" coke " "	1·29
" water " "	0·26
" wages " "	0·84
" wear and tear " "	0·50
Total	1s. 2·79d.

II.—*From Oct. 30 to and including Nov. 6.*

Gas made	5,886,000 cub. ft.
Oil used	19,260 gallons.
" per 1000 cubic feet	3·27 "
Coke used (generators and boilers)	213,612 lbs.
" " " per 1000 c.f.	36·29 "
Illuminating power	23·15 candles.

Cost of Manufacture.

Oil used, 19,268 gallons at 3⅜d. per gallon .	£291	0	6½
Coke used, 95 tons 17 cwt. 1 qr., at 6s. 8d. per ton	31	15	9
Water used, 472,000 gallons at 6d. per 1000 gallons	11	16	0
Wages (manufacture and purification) . .	17	19	9
Wear and tear, oil, waste, &c., estimated .	12	5	3
Total	£364	17	3½

Cost of oil per 1000 cubic feet.	11·86d.
„ coke „ „	1·29
„ water „ „	0·48
„ wages „ „	0·73
„ wear and tear „	0·50
Total	1s. 2·86d.

III.—*From Nov. 6 to and including Nov. 13.*

Gas made	4,821,000 cub. ft.
Oil used	15,696 gallons.
„ per 1000 cubic feet	3·25 „
Coke used (generators and boilers) . . .	180,460 lbs.
„ „ „ „ per 100 c.f.	37·43 „
Water used	327,000 gallons.
Illuminating power	23·06 candles.

Cost of Manufacture.

Oil used, 15,696 gallons at 3⅜d. per gallon .	£237	1	6
Coke used, 80 tons 11 cwt. 1 qr., at 6s. 8d. per ton	26	17	1
Water, 327,000 gallons, at 6d. per 1000 galls.	8	3	6
Wages (manufacture and purification) . .	14	19	1
Wear and tear, oil, waste, &c. (estimated) .	10	0	10½
Total	£297	2	0½

Cost of oil per 1000 cubic feet.	11·81d
„ coke „ „	1·33
„ water „ „	0·40
„ wages „ „	0·74
„ wear and tear „	0·50
Total	1s. 2·78d.

The figures above require little explanation, as I think they speak for themselves. There is only a very slight difference in the cost of oil, accounted for by the difference in the quantity used, and also in the amount of water, also due to the quantity required for keeping cool the valves and for condensation. The amount for wages also depends on the quantity of gas produced. It will be noticed that I have not taken into account the tar, amounting to about 10 per cent. of the oil used, which up to the present time we have burnt under the boilers. I have, however, had an offer of 15s. per ton, which will slightly reduce the figures for the cost of production.

In comparing these figures with your own to find the probable cost to yourselves, it will be necessary to ascertain the cost of the oil, which is the chief item. We had unfortunately to purchase a cargo of 1760 tons during the oil boom; hence the cost of 3⅜d. per gallon. I have, however, evidence that oil will be forthcoming of a similar quality at 3d. per gallon; and I trust before long to see it even below that figure. The price at which the coke is charged is that paid by private consumers. The other charges are purely local matters.

I now come to some of the advantages accruing from the use of such a plant. It will be observed that the intention, purely and simply, in adopting this plant by the Corporation was that of production; but the advantages likely to accrue from it were not overlooked. When it is found that plant with all the accessories, for the manufacture and purification of 1½ million cubic feet of gas, can be put up in the space required by 112 retorts, with the necessary coal-stores, giving a production of half a million, and that the capital charges necessary are so very small, I think you will agree that these two items show in themselves distinct advantages.

But we have also in the same plant a means of enriching our product to anything that we may desire; and the necessity for fuel in the shape of coke, where it is a drug in the market as with us, enables me not only to use up part of the surplus, but also reduces the production on the works, and brings up the market value. I may say that we have no room for the storage of coke; and in past winters we have had to sacrifice a large quantity at a low price in order to have it removed.

One or two other advantages may be claimed; that of the cost of gas per 1000 cubic feet being not the least. Given a supply of oil at anything from 2½d. to 3d. per gallon, gas can easily be put in the holders at or about 1s. per 1000 cubic feet, and of 23-candle power. Another advantage is the smaller quantity of tar and liquor to be disposed of. At the present low prices, this is not to be lost sight of; and should these plants be extensively used, it would have a tendency to increase the value of these commodities.

Having given you some of the advantages of this system, I should like to mention one or two small disadvantages. The specific gravity of the gas being lighter than that of ordinary gas requires increased pressure for the purpose of distribution. For heating and motive power purposes, we are unfortunately not sufficiently forward in the use of this mixture for our manufacturers of gas stoves and engines to have experimented. But, owing to this lighter specific gravity, in a mixture of one-third of water gas to two-thirds of ordinary 'gas, it is necessary to alter the quantity of air supplied—less being required. In one case of complaint of gas-engines not doing their duty, this matter was explained to the maker, and then the difficulty was soon overcome. This also applies to gas heating and cooking stoves; and when properly understood it will cause no difficulty. The disadvantages you will see are of no moment.

A question will no doubt be asked as to what extent this gas can be supplied. To my mind, and from what little experience I have had, I find the mixture given above to be about the best. But eventually, as we get more used to the gas, and our appliances are made to suit the requirements, we shall be able to produce as much gas as we can provide coke for from an ordinary gas-making plant; and the conditions may probably be that we shall erect a plant principally for the production of coke, and not, as now, for the production of gas.

This question of carburetted water gas is one that demands attention from all gas engineers as a ready means of fighting our various opponents. In these times of calls for cheap and good gas, when we all look forward to increased consumption as a means of augmenting our production, we have now ready at our very doors, a system at once effective and cheap, and one by means of which large capitals may be brought nearer in relation to the quantity of gas consumed, and small capitals disappear. And I make bold to say that all will be lacking in their duty if they do not fully consider this system when opportunity for so doing shall arise.

Discussion.

The CHAIRMAN, having referred to the value that the paper would be to gas managers considering the question of adopting water gas, said the primary point in connection with it was the cost. He saw that the lowest cost per 1000 cubic feet was 1s. 2·7d. With this in view, Mr. Ogden went on to state that there were other advantages arising from the process—such as getting rid of the coke, which he would otherwise be unable to dispose of. That would be a factor in the matter, and would prove to be of great value, and a sufficient inducement for the introduction of such a process. But, to his (the Chairman's) mind, 1s. 2d. as the cost of making and putting 1000 cubic feet of gas into the holder was a very heavy price. Taking the cost of ordinary 18-candle coal gas—that was the cost of making only, without the repairs to the apparatus, it came close to 5d. per 1000 cubic feet; and, taking the cost into the holder and repairs and renewals, it worked out to 7d. Then reckoning every other consideration—that was, distribution, rates and taxes, and management charges—the cost came to 1s. 3d. per 1000 feet. What the figure for water gas would assume when all the charges properly belonging to a gas-works were added, he could not say but it was by no means a cheaper method of making gas than many works were manufacturing at in the ordinary way. Another point that would have to be seriously considered in connection with the supply of water gas was that of the calorific value. Where gas was used for heat energy, the calorific value of uncarburetted water gas was only one-half that of coal gas. When it was carburetted, of course it varied according to the quality to which it was increased. As supplied at the present time to the consumer, he believed the calorific value was from 10 to 15 per cent. less than ordinary coal gas. When they remembered that there were tens of thousands of pounds worth of gas used for heat energy apart from illuminating purposes altogether, they had to consider, from the consumers' point of view, what the 10 per cent. less in heat energy would mean to those consumers. The consumers would, he thought, have good cause of complaint if such gas were substituted in lieu of the coal gas which they had previously been using. If he were a gas consumer, and burnt a large quantity of gas for heating purposes, he should certainly have something to say about it; and he thought he would have a very good case indeed. This was a point that must not be lost sight of in considering the question—that they must look to the heat energy as well as the illuminating power.

Mr. HUTCHINSON, speaking with regard to the cost of the gas, said that in some respects he agreed with the Chairman that the cost of the finished gas was higher than that produced by the present system; but he could quite see there were many cases in which the possession of a carburetted water-gas plant would be very useful. He had in his mind an occurrence of a few years ago at Barnsley, and also in Leeds, when such a plant would have been very acceptable (laughter). As far as he could see, Mr. Ogden had not given them the capital cost of the installation. He stated that the Corporation provided part of the work, and the Contractors a certain part. What he should like to know was the total cost, so that they could compare the capital charges of this system with those of the ordinary method. He could readily understand that the capital charges might not be so heavy for a carburetted water-gas plant as those for the plant required for working on the usual system. A point in favour of water-gas plant—and this was a distinct advantage—was that it could be put to work and let down quicker than an ordinary plant.

Mr. C. E. JONES said the paper bristled with statistical information which one would like to digest and compare with results elsewhere. He agreed with the Chairman that the cost of the gas in the holder was somewhat heavy, particularly as it did not compare value for value with that obtained from bituminous coal. If the cost of the oil was reduced (as Mr. Ogden said he hoped

it would be) by one-half, of course the cost of production would be correspondingly lessened. The special feature, however, which he wished to refer to was the independence it gave gas managers when considering the extortionate demands of the colliers and coal merchants. An apparatus of this kind which placed them, in times of emergency, to a large extent independent of the coal producer, would have been of exceptional value to them during the troublous times they had to pass through in 1893. At a meeting of a kindred Association about that time, he took the opportunity of cautioning the coal producers against squeezing the gas industry unduly. On that occasion, he briefly alluded to other means of providing illuminating gas; and this was one of them. He suggested that the paper was of sufficient importance for the discussion to be adjourned to the next meeting, when the members could take it up with a more comprehensive knowledge of its excellencies, and consequently do it greater justice.

Mr. William Carr congratulated Mr. Ogden upon two things—first, that he had not claimed for this process that it threw a number of men out of work; and, secondly, that he said: "I should like to mention one or two small disadvantages." This was the first time he had heard from a reader of a paper on this subject anything about "disadvantages;" so that Mr. Ogden had struck out a new line in this respect. He would also compliment him upon the fact that he had the best apparatus of the kind, so far as he (Mr. Carr) knew, that had yet been brought before the public in this country. He meant that his results were (speaking from memory) the best of any that had so far been published. Mr. Ogden had made out a good case for adopting the plant; and any gas engineer, placed in similar circumstances, would have followed the same course. Personally, he should have done so had he been fixed as Mr. Ogden was. The paper did not give them the capital charges, so that they could work out the cost per ton, or the management charges. Therefore he (Mr. Carr) was obliged to agree with the Chairman that the cost of manufacture was not low. One question he should like to ask was as to the carbonic oxide in this gas—whether Mr. Ogden had had any analysis of it. Also whether he had taken any note of condensation—as to whether, when the gas had been stored for (say) 48 hours, there was any difference in the illuminating power since the time he had first tested it. He was not an alarmist, and he did not want to put any weapons in the hands of people who were already too much prejudiced against gas in any form. But, in his opinion, the important question as to the quantity of carbonic oxide in water gas was one that would some day prove of great trouble to gas makers. So far as he knew, there was no corporation or company that had parliamentary powers to produce water gas in this country; and water gas did contain a large quantity of carbonic oxide, which, he need not tell gas managers, was of an exceedingly poisonous character. It might some time be the cause of death, and give rise to numerous legal inquiries, and probably be an excuse for calling some suppliers of gas "over the coals." Whether he was an evil prophet or not, it struck him that this was what might happen some of these days; and without parliamentary power, he was not quite sure what position a company or corporation who supplied this gas would be in if it was formally brought home that the result of any such fatality was an excessive quantity of carbonic oxide in the gas. But that was a point for Mr. Ogden and others who had tried the gas to consider.

Mr. W. R. Herring (Huddersfield) said the manufacture of water gas was, to his mind, a peculiarly interesting one, because he fancied there might be a time in the near future when illuminating gas would be given up altogether. There was no doubt that the incandescent gas-burner would play a very important part indeed in the future of the gas industry; and he thought their millennium would come when they had to give up illumination altogether (laughter). It would, he was sure, be a happy time for gas managers. But at present they had to put illuminating matter into the gas; and it was important as to how this should be obtained. His own opinion was that they could not make gas of high illuminating power so cheaply by the water-gas plant as by the ordinary methods at their command. Its chief advantage was, no doubt, the means of quick production. Many of them would have felt the benefit of such a plant during the foggy days of the past week, when they were running a neck-and-neck race with their gasholders. From a practical point of view, he thought this was its chief and only advantage. With regard to cost, he was not at all satisfied. He could produce 23-candle gas at a less price than the figures shown in the paper. At his works, he had allotted a space for a water-gas plant so soon as he could see his way clear to put one up with advantage; but he had not yet arrived at that point.

Mr. Ogden, in replying upon the discussion, dealt first with the Chairman's question as to the calorific value of water gas. He said he was informed that the calorific value of 23-candle water gas was equal to 18-candle ordinary coal gas; and from the experience they had had up to now of supplying gas of these qualities mixed (it showed 21 candles when sent out), they did not find the difference between the calorific value of the mixture and the ordinary gas to be at all appreciable. As to the cost, he did not want to put this forward as a cheap method of producing gas. It would be seen that, if the oil could be bought for 2¼d. instead of 3⅝d. per gallon, the cost into the holder would be very materially reduced, and that, at 23-candle power, there would be very much difference between the price of producing ordinary gas and water gas. Mr. Hutchinson asked a question as to the cost of the installation. Roughly speaking, it was £15,000; but that was exclusive of the relief holder. They utilized a holder they had at the time in use.

Mr. Hutchinson: Is that the total for the Corporation and the Contractors?

Mr. Ogden: The total cost to the Corporation and Contractors, and everything connected with the installation.

Mr. Jones: Does it include the buildings?

Mr. Ogden said they utilized an old retort-house; so they had the skeleton building and the relief holder. The £15,000 covered the entire plant, excepting those. The capital charges he had not gone into in the paper; but the management charges he thought were complete, with the exception, perhaps, of his own little "mite." The figures included purification. The water gas was treated entirely by itself until it was put into the gasholder. It was dealt with in its own purifiers; and the charges for purification included all that was spent on the gas in the week.

Mr. Hutchinson: But not the interest on the purification capital?

Mr. Ogden said the 0·5d. per 1000 cubic feet that he had allowed for wear and tear as a matter of fact more than covered wear and tear, and would, practically speaking, cover interest and sinking fund on the whole £15,000. The purifiers were included in the £15,000. Mr. Carr had mentioned the question of carbonic oxide. In the crude gas, it amounted to about 28 or 29 per cent.; but this was, as they used the gas now—one-third water gas to two-thirds coal gas—materially reduced in the general quantity. He had not yet had a chance of trying what the loss of the quality was in the storage holder. He had left that for a time, as he had not thought the weather fit for a test. The worst conditions under which they expected to work at any time should be taken into account.

The Chairman, referring to Mr. Jones's remark as to continuing the discussion at the next meeting, said that Mr. Ogden had intimated that he hoped to get some further statistical information shortly respecting the working of the process; and if he could at the next meeting introduce the subject by a supplementary paper upon the results, the Institution would be still further indebted to him.

Votes of Thanks.

On the proposition of Mr. R. Porter (Elland), seconded by Mr. J. Braddock (Radcliffe), a vote of thanks was passed to the readers of the papers.

Mr. Ogden, in replying, promised that if he could get the necessary statistics prepared in time for the next meeting, he should be delighted to submit a supplementary paper on the same subject; and he also expressed the pleasure he would have in meeting any of the members at his works to view the water-gas plant.

The Chairman having been heartily thanked for presiding,

On the suggestion of Mr. Jones, it was agreed that a telegram should be sent to the President, expressing the sympathy of the members with him in his illness.

This concluded the business; and shortly afterwards the members, with a number of friends, had tea together.

Electric Lighting of Trains.—A new system of electric lighting for railway carriages, the invention of Mr. Gill, has been carried out by Messrs. Stone and Co., of Deptford, on the London, Tilbury, and Southend Railway. Each carriage has its own dynamo attached beneath it, which is driven by a pulley and belt off the axle; and the current from it is sent into a battery of secondary cells, weighing about 3 cwt. There are several ingenious details which surmount the difficulties hitherto met with in this method of lighting.

Damp-Courses and Concrete Layers in Buildings.—In the course of a paper on "The Municipal Control of Buildings," read by Dr. G. B. Longstaff, the Chairman of the Building Act Committee of the London County Council, at the meeting of the Architectural Association on the 22nd ult., he called attention to a curious fact in connection with foundations and damp-courses in London. These are at present regulated by an old bye-law under section 16 of the Metropolitan Management and Building Act Amendment Act, 1878. A great part of this Act, including the section mentioned, has been repealed; but the bye-law continues in force under section 216 of the Act of 1894. The main reason for its existence is that, while speculative builders do not, as a rule, see the necessity for damp-courses, layers of concrete, and so forth, after a wall has once been erected a damp-course can only be put in at the expense of much labour. It has been pointed out that, in so far as a layer of concrete beneath a building is designed to exclude emanations from the earth, it is more necessary in the case of a gravelly soil than in any other; yet the bye-law specially exempts gravelly sites. Dr. Longstaff pointed out that the danger, which is a very real one, has been proved on more than one occasion by explosions of coal gas in houses, traceable to leaks from the mains under the impervious soil of the street pavements outside. A notable instance of this has been recently furnished by the fatality in the Strand.

AMERICAN GASLIGHT ASSOCIATION.

Annual Meeting at Philadelphia.

(*Concluded from p.* 1086.)

A paper on the "Ventilation of Gas-Lighted Rooms" was read by Mr. Irvin Butterworth, of Columbus (Ohio). The author admitted that the electric light man's strongest point against coal gas was the fact that its use was attended with more or less generation of heat and vitiation of the air; but he also thought that the problem of ventilating gas-lighted rooms might be attacked, with excellent chances of securing good practical results that would aid in increasing the popularity of gas lighting. Although an admitted need, the subject had been neglected; and American gas engineers seemed inclined to pass it over in silence as a "weak spot." But he preferred to study and discuss it boldly, as there was room for much improvement; and many popular delusions respecting it would be dispelled, to the great advantage of gas. The first move in this direction, which was made more than 60 years ago, was to provide a cap or hood over each individual burner, to take the products of combustion directly away. But it soon became evident that these devices were expensive, unsightly, troublesome, easily affected by draught, and after all did not greatly assist the ventilation of the room. They led to the introduction of the sun-burner, and of ventilating regenerator lamps; and there was no question but that rooms could be well lighted and ventilated by these means. M. Bandsept, Professor Lewes, and Mr. Simmance had conclusively proved that the same gas which would adequately light a room, could be made at the same time to properly ventilate it, and that both lighting and ventilating were better than was possible with electricity. Bearing these facts in mind, it was surprising that the ventilating gas-lamp was so little used; and the explanation was that the installation is both costly and troublesome, and generally not adaptable in ordinary dwelling-rooms, while the public were not yet educated to an appreciation of its advantages. A simpler and more easily applied system was required. The author proceeded to expose the fallacy of supposing electric lighting to be more healthful than gas lighting, and that the proportion of carbonic acid in a gas-lighted room was the measure of the impurity of the air. It was not true that the products of combustion from properly purified gas were exceedingly injurious; or that under ordinary circumstances they accumulated in a room in sufficient quantity to render the atmosphere unwholesome. A room in which the air could be sensibly affected in this manner, was not fit for habitation for any length of time. Gas lights created currents of air, which electric lights failed to do; and as regards absence of heat with the electric light, it did not follow that cold air was necessarily purer than warm air. He then showed that the really harmful impurities in the air are not products of combustion, but products of respiration and exhalations from the skin of living bodies. Although electricians and theorists had made much of the alleged insalubrity of coal gas, it was probable that the *heat* produced was a far more popular objection in practice; and that if this could be removed, there would be no other complaint. With the aid of a diagram, this point was fully discussed; and the author insisted on the need for removing the products of combustion at the ceiling level, and preferably independently of the chimney. He was not speaking from theory only, but from actual results gained in practice; and he concluded with a suggestion that the Association should appoint a Committee to prepare simple but detailed rules for the ventilation of gas-lighted rooms. [The Research Committee are to undertake this work.]

The President said the paper dealt with an important and interesting question, which was worthy a full discussion. Mr. Egner suggested that not only had gas engineers neglected the subject, but had sometimes made too light of it. He knew instances of gas consumers being told that gas heating-stoves could be used without special provision for taking away the products of combustion. Mr. M'Ilhenny heartily approved the suggestion at the close of the paper; and instanced the hall of the Franklin Institute, and the English Houses of Parliament, as good examples of gas lighting and ventilation. Mr. Littlehales agreed, and he added the Masonic Hall, Hamilton, Canada, to the examples quoted. Mr. Ramsdell said that ventilation by means of gas was largely adopted in France. Mr. Langford had successfully ventilated a stuffy room in his own house on the lines suggested in the paper. Other speakers strongly supported the conclusions arrived at by the author.

The Question-Box was then opened. In discussing the question of the average error of dry meters, it appeared that, with proper precautions, there need be no important error at all. The average of the official tests at Columbus, was under ½ per cent. slow; and Mr. M'Ilhenny knew of 3000 meters that were tested after five years' average use, when the average result was only ¼ per cent. slow. In reply to another inquiry, Mr. Pratt gave the production of tar from a Lowe water-gas apparatus as one-eighth of the oil used. He mixed it with breeze, and used it under the boilers. There was a long discussion on the loss of value suffered by gas coals in store, from which it appeared that some sorts were practically unaffected, while others materially depreciated, and that small or soft coal was the worst to stack. Mr. M'Millin referred to some tables on the subject submitted to the Ohio Association about ten years ago by General Hickenlooper.

PHOTOMETRY IN GERMANY.

The Commission appointed by the German Association of Gas and Water Engineers to investigate photometry as applied to the testing of gas have recently published the provisional report on their labours, which was presented at the last meeting of the Association. The report is signed on behalf of the Commission by the late Herr S. Schiele. The following summary of it is made from the *Journal für Gasbeleuchtung*, the official organ of the Association.

A number of experiments with the Lummer-Brodhun photometer have been made; and the mean variation with several modifications determined. The report states that the improved Lummer-Brodhun photometers of the Imperial Physico-Technical Institute of Frankfort, and one by Krüss, in which the line of observation is in the axis of the photometer, are especially convenient for general use. The standard light should be at a fixed distance from the screen, and moveable with it. For the Hefner unit, the distance should be 30 cm. (11·8 inches), to correspond with the candle at 14 inches; and the photometer table may be 250 cm. (98·4 inches) in length. The gas-burner and Hefner unit or candle must be brought to the proper height with the screen, by a screw adjustment. There should be two scales—one for a fixed position of the unit of light, and the other for use when the unit and screen are moved together. The carrier is to be arranged so that the Hefner unit can be clamped at one end of the table, or fixed at a certain distance from the screen and moved with it. The prisms and mirrors should be protected from dust by the interposition of glass in the openings through which the light travels; and the photometer should be arranged so that the Bunsen disc may be used if desired.

The report proceeds to a brief review of the report of the Dutch Committee on Photometry,* and to a critical study of the ether-benzene standard lamp and the system of photometry proposed for adoption in Holland. It is surmised that an international unit of light is improbable in the near future. The Commission are engaged in testing a number of hollow-top flat-flame burners, in order to find the most suitable for a consumption of 4 to 6½ cubic feet of gas per hour; but the experiments are not yet completed.

The Antiquity of Cast Iron.—Cast iron was not in commercial use before the year 1700, when Abraham Darby, an intelligent mechanic, who had brought some Dutch workmen to establish a brass foundry at Bristol, conceived the idea that iron might be substituted for brass. This his workmen did not succeed in effecting; being too much prejudiced in favour of the metal with which they were best acquainted. A Welsh shepherd-boy named John Thomas had, some little time previous to this, been received by Darby into his workshop. While looking on during the experiment of the Dutch workmen, he told Darby he thought he saw where they had missed it. He begged to be allowed to try; so he and Darby remained alone in the workshop all night, struggling with the refractory metal and imperfect moulds. They eventually succeeded in casting an iron pot complete. The boy entered into an agreement with Darby to serve him and keep the secret; and for more than a hundred years the process was practised at Colebrook Dale with plugged keyholes and barred doors.

Calorimetry by the "Method of Mixtures."—An improved calorimeter, for the application of the method of mixtures in determining specific heats, has been described by Mr. F. A. Waterman in the *Philosophical Magazine*. Mr. Hesehus's ingenious suggestion is acted upon, to maintain the calorimeter, after the introduction of the heated body, at a constant temperature by means of cold water, instead of measuring the rise of temperature of the calorimeter. This arrangement gets rid of the radiation error, and eliminates the "water equivalent" of the vessel. By dropping the cold water in, stirring is also made unnecessary. The method has been placed by Mr. Waterman upon a footing of equality at least with other systems; but his success may be partly due to other improvements. The body experimented upon is heated by a coil of wire conveying a current, and surrounded by ice. The initial temperature of the body may thus be regulated by simply maintaining the current at a certain strength; and this temperature can be kept constant for five or six hours together to within 0·1° C. The body is then plunged into a silver calorimeter surrounded by the bulb of a delicate air thermometer indicating a difference of temperature of 0·01° C. The cold water is contained in a copper vessel having the shape of an inverted cone surrounded by ice. In this manner, the ice cannot melt away and leave a free space round the vessel. The water-dropping arrangement and the electric heater are mounted on vertical axes in such a manner that they can be quickly swung into position just over the calorimeter. After the heated solid or liquid has been dropped in, the water-dropper is set to work—at first rapidly, and then slowly until the body has assumed the original temperature of the calorimeter. For bodies of the same weight and the same initial temperature, the specific heat is simply measured by the amount of ice-cold water necessary to cool them to the temperature of the room.

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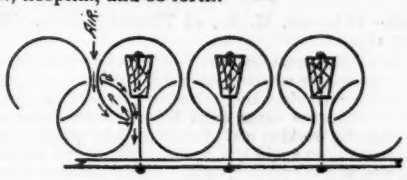
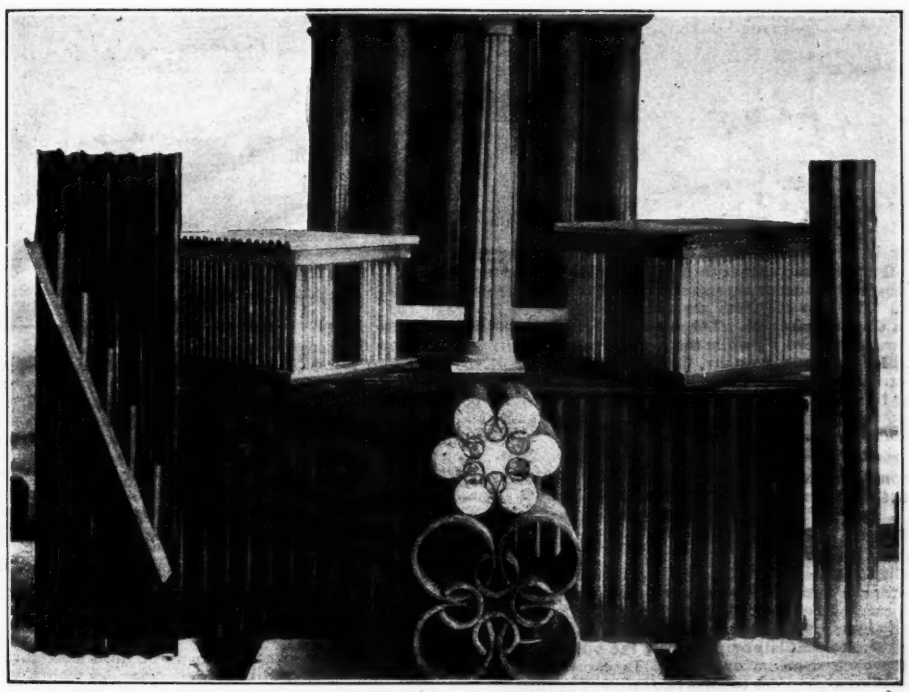
* JOURNAL, Vol. LXIV., pp. 1161, 1209.

PEASE'S TUBULAR METALLIC BUILDING CONSTRUCTION.

The accompanying illustration represents some of the forms in which Mr. E. Lloyd Pease (of the firm of Ashmore, Benson, Pease and Co., Limited) is now making his patented tubular metal and concrete construction for columns, partitions, and roofs. The system appears to be one of the greatest advances made in the direction of rapid, strong, fireproof, and economical building since the introduction for this purpose of corrugated iron sheeting. Corrugated ironwork construction was a great advance upon everything that had gone before it, for many obvious applications. But since its first appearance and instantaneous growth in popularity, invention in this regard seems to have stood still. Mr. Pease's system was noticed in the JOURNAL upon its first public manifestation; and we mention it again now to make our readers acquainted with what is being done to extend i s applications. The illustration is reproduced from a photograph of a group of model forms. In the centre, at the back, is a tubular ventilator, the construction of which is further shown by the accompanying small section figure. This device is susceptible of several modifications; but it will be perceived how the interlocking of the two rows of tubes effectually prevents the admission of rain with the air, whether the appliance is fixed horizontally or on edge. The amount of air admission in this example is regulated by wooden strips, which are just visible between the tubes, and are hinged at the top. When these are drawn forward by means of the connecting bar, the ventilator is closed. The merits of the device are its simplicity and its quality of being weatherproof, and the ease with which it can be carried out over a large area—such as the roof of a large building, as a public hall, hospital, and so forth.



In front of the ventilator is placed a taper reeded column and in the foreground appear sections of columns as made up with thick and thin metal, which can be done in lengths of 30 feet without a joint, and in a great number of designs. From these and the model pavilions, it can be seen how this system of construction—unlike other ironwork—lends itself in the hands of a skilful architect to the production of a naturally decorative effect. The two pavilions are different; the one on the right being made up of equal sized tubes of the thinnest sheets obtainable. Without any extra cost for material, these walls may be made 3 inches to 9 inches thick, and may be filled with dry earth, peat, moss, or other non-conducting substance. The thicker walls are the cheaper, because the number of tubes in them is less. The system is naturally more expensive than corrugated iron sheeting; but the buildings are heat and cold proof, and are made without bolts or nails. One of the pavilions is even more portable than the other, since the walls and roof will roll up. The construction provides an excellent key for plaster if required. On the left hand side of



the illustration is shown a piece of flooring with a stiffening bar running diagonally across a wide span. These floors are very strong, and need no ceiling. The column on the opposite side is composed of polished brass tubes. The modifications and developments of this system of building construction seem to be almost endless.

Institution of Junior Engineers.—At the meeting of this Institution next Friday, a paper is to be read by Mr. J. Julian, of the Borough Engineer's Office, Cambridge, on "Water, Gas, and Electric Mains, &c., in Connection with the Formation of Urban Roads and Footways."

Private Bill Legislation.—The time allowed by the Standing Orders of Parliament within which to give notice for the introduction of Private Bills for the ensuing session expired last Wednesday. From the official notices published in the *London Gazette*, it is found that the total number of Bills in course of preparation is 170—precisely the same as the number actually deposited last session. A general analysis of these Bills shows that 62 relate to railways, including electrical and light railways; 24 refer to gas and water undertakings; 37 are promoted by Corporations, District Councils, and other public bodies; 11 deal with tramway undertakings, including tramroads; and the rest to piers, harbours, docks, and miscellaneous matters. Of the total number of Bills, not more than 23 may be classed as affecting London and the suburbs. This is considerably below the average. These Bills include five promoted by the London County Council, and three by the London Water Companies.

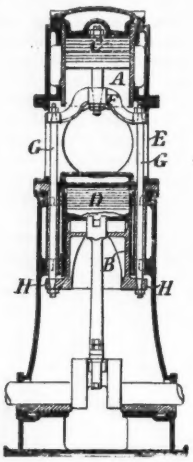
Abandonment of the Coal Boring in Suffolk.—The Directors of the Eastern Counties Coal-Boring Association have decided to discontinue the boring at Stutton, which has been proceeding for about a year in the hope of finding coal. The boring was carried to a depth of 1525 feet; the strata passed through being as follows: Drift (river gravel), 16 feet; London clay and Reading beds, 54 feet; upper and middle chalk, 729 feet; lower chalk, 154 ft. 6 in.; gault, 49 ft. 6 in.; and Palæozoic rock, 531 ft. It is possible another trial will be made at Bramford, which lies to the north of Stutton.

The Expansion and Contraction of Concrete.—In an article published in the *Annales des Ponts et Chaussées*, M. Dutoit remarks that the expansion and contraction of the concrete in large reservoirs, due to the changes of temperature, are so great as to cause cracks which open in the winter and close in the summer. If these are filled up, fresh ones open near them, so that it is useless to repair them. The new covered reservoirs at Paris are built of a silicious stone; and were it not for these fissures, it would have been set in concrete, so as to form one homogeneous mass sufficient to have proportioned the walls for stability and to set them on solid earth. The foundation is, however, on a bed of gypsum and marl, and its soundness would be affected were water to reach these beds. To prevent this, drainage tunnels of elliptical section were formed on the floor of the reservoir, which intercept any leakage, so that it can be carried clear of the foundations. The walls of the reservoirs below ground are similarly surrounded with broken stone placed in a trench, the bottom of which is plastered and sloped, so as to lead off any water getting through the walls into the drains.

REGISTER OF PATENTS.

Gas-Engines.—Robinson, M. H., of Thames Ditton. No. 23,028; Nov. 27, 1894.

In order to obtain pressure constantly in the same direction upon the brasses of an engine working upon the "Otto" cycle, the patentee proposes to use two single-acting cylinders placed tandem-wise, or one beyond the other in the same axial line, upon the same side of the crank, and with the working end of each cylinder placed farthest from the crank. In order to avoid the use of a piston-rod passing through the working end of one cylinder, each piston or plunger is connected to a crosshead, and both crossheads are fixed rigidly together by rods or bars passing outside the cylinder nearest to the crank. Explosion is arranged to occur in each cylinder alternately. Thus, if the engine is vertical, with the cylinders above the crank, then upon every upstroke one or other of the pistons will be engaged in compressing a charge for explosion upon the following downstroke, with the effect of cushioning, upon each upstroke, the whole system of pistons and rods—in other words, they are held in constant thrust against the crank-pin upon every non-effective stroke.



The illustration is a vertical section of an engine arranged, as described, to keep the parts in constant thrust. A and B are the two cylinders in which explosions occur alternately; and C and D are their respective pistons. The two cylinders are placed tandem-wise, and are separated by a distance-piece E. The upper piston C is shown with a piston-rod and crosshead F; while the lower piston D is formed as a trunk piston. It is obvious, however, that it might (if desired) be also fitted with a crosshead, similar to C. The two pistons are rigidly connected together by side rods G, which are bolted to the crosshead F, and to lugs H upon the trunk piston D. These side rods G pass outside the lower cylinder B, the cover of which is solid.

Utilizing Heat from Gas and other Lamps for Warming Carriages, Rooms, or other Enclosed Places, and for Ventilating Same.—Sykes, T., of Lingards, near Huddersfield. No. 23,142; Nov. 29, 1894.

This invention has reference to railway carriages, rooms, or other enclosed places, wherein the light for illuminating same is closed from the interior or otherwise protected by a shield or cover; the object being to warm the carriages or enclosed place by the heated products of combustion, or by atmospheric air conducted through the lamp and heated therein, and also to ventilate or withdraw the vitiated air from the interiors of the compartments or rooms. In carrying out this arrangement, the patentee proposes to form two series of openings, one above the roof or ceiling, or communicating with the atmosphere, and the other below, or communicating with the interior of the carriage or room; and in conjunction with the openings to provide moveable grates or slides adapted to close or expose the openings at will, but so arranged that when one series is closed the other is open or exposed.

Mounting Incandescent and other Gas-Burners in Street-Lamps.—Redman, T., of Bradford. No. 23,715; Dec. 6, 1894.

To prevent the fracture of incandescent mantles when used in street-lamps, the patentee proposes to lead the gas-supply pipe to within a suitable distance of the gas-burner in the usual manner. At the termination of the pipe, a tap is coupled by a flexible tube to the metallic connection to which the gas-burner is fitted. The burner is suspended by an arrangement of springs or elastic connections, coupled to some convenient portion of the lamp or other fixture, or it may be supported by an elastic or spring-cushioned chair. In either style of mounting, should the lamp receive a shock, the vibration to the burner and delicate attachment is prevented (or greatly reduced) by the intervening spring or elastic mounting.

Prepayment Gas-Meters.—Peebles, D. B., of Edinburgh. No. 24,231; Dec. 13, 1894.

This invention has for its object "to construct and combine parts in an improved manner to form simple, compact, fraud-resisting, and otherwise satisfactory mechanism, to secure the delivery of gas through a meter in proportion to prepayment by coins inserted in a slot or coin-inlet."

Fig. 1 is a sectional elevation, and fig. 2 is a sectional plan of the meter. Fig. 3 is a vertical section at right angles to part of fig. 1; fig. 4 is a sectional plan showing some parts not seen in fig. 2; and fig. 5 is a sectional elevation showing parts not seen in figs. 1 and 3.

Fig. 1.

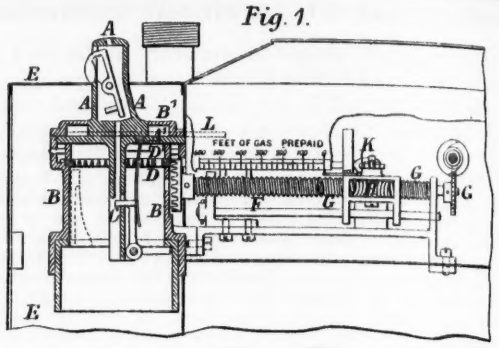


Fig. 2.

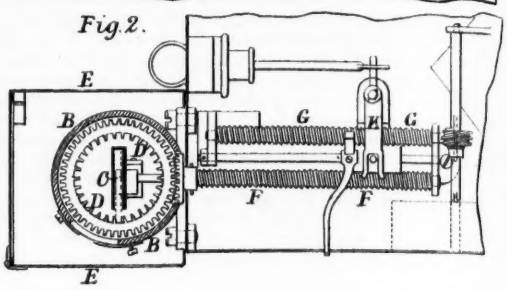


Fig. 3

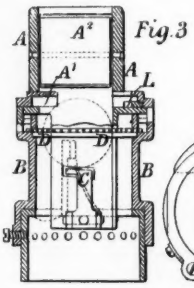


Fig. 4.

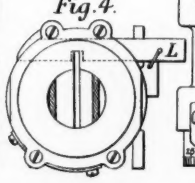
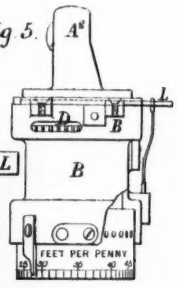


Fig. 5.



The coin-inlet is formed in a piece A fixed on a disc A^1, which can be turned about a vertical axis by means of the inlet-piece as a handle; the disc being fitted in the upper part of a hollow cylindrical body-case B, and being retained in position by a cover made in halves, and fixed by screws. One side of the inlet-passage is normally inclined, being formed on a piece A^2 mounted on a horizontal axis, but weighted so as to assume the position shown in fig. 1. When a coin has been inserted, and is wholly within A, the part A^2 is, by pressure of thumb or finger on its upper outer end, made to assume a position in which its guiding surface is vertical; and while obstructing the top inlet opening, it uncovers a slot formed across the centre of the disc, and extending downwards in a part projecting down from the under side of the disc. This arrangement is intended to prevent the fraudulent introduction of a wire or instrument. The middle of the slot, as seen in fig. 3, is not concentric with the disc; and the coin, when in the slot, projects more on one side than on the other. The inlet-piece A may be in any position when the coin is inserted; but the coin does not descend far enough to act on the meter freeing mechanism unless or until after turning the inlet-piece with its disc, the slot in the disc coincides with a notch in the cover. The laterally projecting side of the coin otherwise rests on the unnotched part of the ring or flange forming the cover. When the disc-slot and cover-slot coincide, the coin drops down to the position indicated by a dotted circle in fig. 3, and is there retained by a small cross-bolt C, and the projecting side of the coin engages between two internal teeth of a ring D. This is made with both internal and external teeth, and is fitted loosely in a groove made for it in the body-case B, while another ring lying upon it, and prevented from turning by a pin at one side, prevents this ring from being turned frictionally by the disc. When the ring D has been turned a certain distance round, the cross-bolt C is withdrawn; and the coin drops into a receptacle E—the turning of the toothed ring D being thereupon discontinued, whether the inlet-piece A be turned farther or not. The bolt C is formed on the vertical arm of a bell-crank having a horizontal arm, the outer end of which moves in contact with the under side of an inward flange formed on a cylindrical ring, and which flange has at one part of it a cam projection indicated by a dotted line in fig. 3. When the bell-crank arm, in turning round, encounters the cam projection, the bolt C becomes drawn in so as to release the coin; and it follows that the position of the cam projection will determine the extent of rotation which can be imparted by means of each coin. To further ensure the proper limitation of the rotation, the ring has fixed to it a stop-arm extending up inside the body-case B, and which is encountered by the coin when in turning it reaches the position at which it should stop—this stop-arm preventing any further rotation of the coin, and being so placed that, as the coin reaches it, the bolt is withdrawn, and the coin can drop into E.

A scale is marked on the outside of the ring (as shown in fig. 5); and a number of holes are formed in the ring, into one or other of which a screw can be arranged to fix the ring in a position corresponding to the price of gas—in other words, to the quantity to be delivered for each coin. A slot is formed in the body-case B at a part to give access to a few of the external teeth of the ring D, to enable a gas officer to adjust

the mechanism to zero or other position, by means of any suitable instrument. All the parts, with the exception of the upper part of the inlet-piece A, are enclosed in the casing of the receptacle E, which is fitted with a door with lock and key.

The mechanism which has been so far described may be combined with the meter mechanism by any suitable one of the many known devices proposed for that purpose. The device shown in figs. 1 and 2 is one which the patentee believed to be new when he applied for a patent, but which he has since ascertained was not so. In this device, the external teeth of the ring D gear with, and drive, a crown or bevel wheel on a screw-spindle F, parallel to which there is a second screw-spindle G, the latter being acted on by the meter mechanism through a worm gearing with a worm-wheel on the spindle G. Between the two screw-spindles E G there is a pinion H, gearing with them; both its teeth being inclined like those of a worm-wheel. When what may be termed the coin-spindle F is turned, it makes the pinion H roll along the meter or other spindle G, and a pointer J, moved by the centre of the pinion, shows on a scale the quantity of gas prepaid for. As the meter passes gas, the meter-spindle G makes the pinion H roll back on the coin-spindle E, so as to return the scale-pointer J towards zero. The pinion H is held in a small box fitted to slide on a fixed guide-rod; and a pin fixed in the box engages with the forked end of a lever, the other end of which acts on the spindle of the gas-inlet valve of the meter The pinion-box has fixed to it a stop projecting upwards, and which, when the scale-pointer J approaches the maximum end of the scale, acts on a flat bar L, which then prevents the introduction of additional coins by partially closing the notch in the cover.

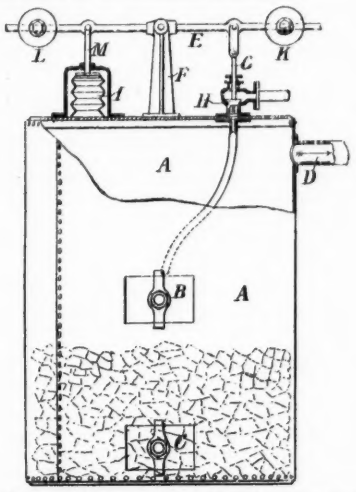
Production of Ammonia and other Products from Heating Coal or Carbonaceous Minerals.—Meikle, J., of Maryhill, Glasgow. No. 25,173; Dec. 28, 1895.

The claim for this invention is for the treatment of coal or other carbonaceous minerals, so as to obtain ammonia and other products, maintaining the residuary coke (produced by distilling off the volatile constituents of the coal in a retort or vessel) at a high temperature, and injecting superheated steam and "fire gases."

In carrying out the invention (of which no illustrations are given), the patentee proposes to first distil off the volatile constituents of the coal in any suitably externally-heated vessel; continuing to maintain the residuary coke at a high temperature, by injecting superheated steam into the retort, so as thereby to obtain a large quantity of ammonia. When, after a time, the evolution of ammonia decreases, there are injected along with the superheated steam "fire gases"—that is, "the gaseous products of combustion, by preference using such gaseous products as are formed by the combustion of producer gas"—introduced by the jet action of the steam, or by a blower. This use of fire gases in conjunction with superheated steam is said to produce a considerable additional yield of ammonia, which has mixed with it other products, including cyanogen compounds, which can be separated by any known means and separately utilized.

Producing Acetylene.—Gearing, E., of Harrogate. No. 25,203; Dec. 28, 1894.

This invention has reference to generators suitable for producing acetylene by the use of carbide of calcium and water; the supply of water being controlled in an automatic manner.



In the engraving—showing, partly in elevation and partly in vertical section, such a gas-generating apparatus—A (the main or body part of the generator) is constructed of steel plates riveted together; the opening, about midway of its height, for the introduction of carbide, being provided with a door B that can be hermetically closed. Another opening, provided with a similar door C at or near the bottom, is for the purpose of clearing out the lime and bye-products. The outlet D is at the side near the top for gas generated.

The apparatus for controlling the supply of water is arranged at the upper part of the generator body. It is so constructed that, when gas is being generated more rapidly than it is being drawn off through the outlet D, the consequent increase of pressure within the generator will operate the valve-controlling mechanism, so as to shut off (or partly shut off) the water supply, until, by the withdrawal of gas, the pressure in the generator falls, whereupon the water supply will be automatically more or less opened. E is a lever, having its fulcrum in a suitable standard or upright F. Connected to one of its arms is the spindle G of a controlling valve H; and to the other arm is a collapsable vessel I (or a diaphragm) exposed to the pressure of the gas within the generator. The arms are also furnished with weights K L, by adjusting which the apparatus can be set to cut off the supply of water on the gas within the generator attaining such pressure as may be predetermined. With this arrangement, when gas is being generated more rapidly than it is being drawn off, and the pressure within the generator consequently increases, such pressure acting against the under surface of the top of the collapsable vessel I (or upon the diaphragm, as the case may be) will lift the corresponding end of the lever E, thereby depressing the other end to which the water-valve spindle G is connected, and thus will gradually cut off the supply of water, and arrest the generation of gas—the valve closing against a suitable seat. As gas is drawn off, and the pressure is consequently reduced, a reverse action of the lever will occur, whereby the valve will be opened, the supply of water will be renewed, and generation of gas will again take place.

In lieu of the collapsable vessel shown, a diaphragm of any suitable construction—such as a disc of leather or vulcanized india-rubber—secured around its periphery to the surrounding casing, and provided with a central metal plate or plates for attachment of the connecting-rod M, might be substituted; and in lieu of a water-valve of the shape indicated at H, a valve capable of being worked directly or indirectly from the lever E might be substituted.

Gas Motor Engines.—Humphrey, H. A., of Northwich. No. 347; Jan. 5, 1895.

In engines of this construction, the charge, consisting of gas or oil vapour mixed with air (all under pressure) is pumped into a chamber between two pistons rigidly connected together, so as to constitute a slide-valve; and in this chamber, which is cooled by a water-jacket, when the two pistons are in such a position that they cover a port from the pump and a port to the working cylinder, the mixture is ignited. The pistons are then moved in one direction, so uncovering the ports that the combustion gases enter the working cylinder, expanding therein, and propelling its piston; and the pump, the piston of which moves with the main piston, draws in a fresh charge. When the main and pump pistons have completed their outstroke, the slide-valve is moved so as to open the cylinder-port to the exhaust; and a discharge-valve is opened from the combustion chamber, through which a current of air is caused to pass in such a manner as to clear out the combustion gases and fill the chamber with air, whereupon the chamber is again charged with combustible mixture, and the action is repeated. By adding a second larger working cylinder, and a third piston to the two which form the valve, so as to govern its port, the engine can be worked as a compound engine, the exhaust from the first working cylinder passing into the second larger cylinder, and operating therein on its piston, which is linked to a crank opposite to that for the piston of the first cylinder.

Gas-Engines.—Wildt, O. H., of Paris. No. 6151; March 25, 1895.

This invention relates to a gas-engine, the distinctive objects of which are: (1) To render such engines more economical, to reduce the temperature of the gases at the exhaust by a considerable prolongation of the expansion, and by utilizing the partial vacuum which may be created by cooling the products of combustion before allowing them to escape into the atmosphere, as in the case of air-engines. The volume of the burnt gases being greater at the termination of the expansion than that of the explosive mixture admitted, the contraction of the gases by cooling in a closed chamber must thus necessarily create a partial vacuum. (2) To obtain greater regularity in the working of such engines, by producing an impulse upon one or both faces of the piston at each revolution of the fly-wheel, while still retaining the advantage of inhaling the explosive mixture into the working cylinder itself. The impulse may be varied, according to the work to be done, by varying the volume of the mixture admitted, while the proportions of the gases constituting the explosive mixture may remain invariable; but the engine never misses fire during the working. To effect this object, the engine works upon the two-phase cycle principle—that is to say, considering one side of the piston only, it receives a working impulse at each outward stroke (from the end of the cylinder to the most forward point), while the exhaust of the burnt gases, the inhalation of a fresh mixture, and the compression to a regular or variable extent of the mixture, are all effected during the backward stroke.

Igniting Attachment for Gas-Burners.—Riordan, T. V., of Clapham. No. 16,428; Sept. 2, 1895.

This invention relates to an attachment for gas-burners, whereby the gas on issuing is ignited "by its chemical action upon a medium held by such attachment."

The attachment is formed of suitable resilient material; a spring clip being adapted to be slipped over or around an ordinary burner, and be securely maintained in position thereon. At the top of the clip, and attached thereto, is a small holder A (rounded or turned in the opposite direction) designed to receive "a suitable igniting medium." The attachment is adjusted so that the igniter may just catch the bottom of

the stream of gas issuing from the burner. The material employed is a mixture of platinum black, white clay, and flint powder, in or about the proportion of one part of each, thoroughly mixed together, and then moulded into plugs or pellets of the required dimensions. These are afterwards fired at a high temperature, which renders them very porous. In this plug or pellet is inserted one or more fine platinum wires twisted together, and projecting from the plug, so that when the "gas containing hydrogen is turned on and reaches the plug or pellet, the material of which the latter is composed is ignited through the agency of the finely-divided platinum, in the well-known manner."

APPLICATIONS FOR LETTERS PATENT.

21,315.—ALLEN, W., and BARKER, L. C., "Oil and gas engines." Nov. 11.
21,340.—CATON, G. J. J., "Burners for incandescent gas lighting." Nov. 11.
21,341.—CATON, G. J. J., "Burners for incandescent gas lighting." Nov. 11.
21,364.—HARDINGHAM, G. G. M., "Controlling the supply of gas to burners." Nov. 11.
21,369.—FELDMANN, S., "Bunsen burners." Nov. 11.
21,429.—HAWKYARD, J., and BRADDOCK, J., "Prepayment gas-meters." Nov. 12.
21,468.—CALVER, W., "Manufacture of gases." Nov. 12.
21,517.—THORNEYCROFT, W., "Manufacture of coke." Nov. 13.
21,521.—PINCKNEY, P., sen., "Power generator and heat motor." Nov. 13.
21,570.—SANFORD-BURTON, H., "Lamp for illuminating and other purposes." Nov. 13.
21,574.—FESSARD, E., "Gas and oil engines." Nov. 13.
21,581.—CORP, J., "Gas-lighting device." Nov. 13.
21,598.—CLEE, F. J., "Clip for the repairing of burst water-pipes." Nov. 14.
21,650.—HINCHLIFFE, J. S., "Oil and gas engines." Nov. 14.
21,678.—RASCHEN, J., and BROCK, J., "Manufacture of cyanides and ferrocyanides from sulphocyanides and recovery of bye-products." Nov. 14.
21,696.—EDGE, J., "Gas and oil motor engines." Nov. 15.
21,757.—GEARING, E., "Gas-burners." Nov. 15.
21,774.—MAGEE, J., "Gas-engines." Nov. 16.
21,793.—PINCKNEY, P., "Artificial lighting." Nov. 16.
21,846.—KIRKHAM, H., "Lighting incandescent gas-burners." Nov. 18.
21,880.—BLOMMART-MILES, E., "Automatically lighting and extinguishing street and other gas-lamps at any time desired." Nov. 18.
21,898.—STEVENS, J. H., and TOURTEL, J., "Coin-freed cocks for the supply of gas or other fluids." Nov. 18.
21,914.—HUGHES, T., "Coin-freed apparatus for meters." Nov. 18.
21,929.—HANCOCK, F. L., "Protecting incandescent gas mantles." Nov. 18.
22,055.—PURVES, J., and HYDE, H. L. W., "Making gas." Nov. 20.
22,132.—DOULTON, H. L., and MELDRUM, R., "Purifying water." Nov. 20.
22,303.—CRAIG, G., "Estimating the carbonic acid or other constituents in gases or products of combustion." Nov. 22.
22,401.—PEEBLES, D. B., "Coin-prepayment mechanism for gas-meters." Nov. 23.
22,402.—DION, A. DE, and BOUTON, C., "Motors worked by explosive mixtures." Nov. 23.
22,418.—NOTTINGHAM, W., "Portable grill for oil and gas stoves, ranges, and like purposes." Nov. 23.
22,432.—KERRIDGE, J. H., and YOUELL, H., "Starting gas and similar engines." Nov. 23.
22,438.—STEVENS, G., "Preventing the freezing of water in water-supply pipes, cisterns, and adjuncts." Nov. 23.
22,439.—SCHURR, A. E., "Fittings for incandescent gas-lights." Nov. 23.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Standards of Light.

SIR,—I thank Mr. Williams for his courteous reference to my article on this subject; but at the same time I must adhere to the statements I have already made. Mr. Williams still seems to think that the standard candle can be so modified as to be an accurate standard of light. From this I entirely disagree; and I still claim that the Dibdin ten-candle standard affords us the most absolutely accurate means of ascertaining the illuminating power of all grades of gas.

Mr. Williams has confessed that "a candle determination of value appeals strongly to public sentiment, by giving a demonstration of value which is satisfying to popular claims and expectation founded upon long usage." If this is admitted, what possible objection can there be to the maintenance of the term "candles," although applied to a standard of another character? My special point is that, in using standard candles, we have what professes to be a standard, but which is actually nothing of the kind. There are so many complications with regard to wick, temperature, material, and general conditions of working, that certain and definite results are almost impossible to obtain. Although many suggestions have been made to rectify the abnormal results given by the standard candle, as yet there has been nothing definitely proved to have any practical value.

With regard to a gaseous standard, such as the Dibdin so-called ten-candle, we have at least a fixed and constant standard of light. We have no complications of wick, melting-point of solid material, or temperature, &c.; and that the light is expressed in terms of candles is simply a concession to popular prejudice, as it was thought undesirable to alter the form of expressing the amount of light afforded by the gas supplied to the public.

Nov. 29, 1895. "VERITAS."

PARLIAMENTARY INTELLIGENCE.

NOTICES GIVEN FOR BILLS (SESSION 1896) RELATING TO GAS AND WATER SUPPLY AND ELECTRIC LIGHTING.

Aldershot Gas and Water.—The Aldershot Gas and Water Company intend to apply for powers to construct a tramroad between the Tongham Railway Station and the gas-works, and also for an extension of their water limits so as to include portions of Farnham, Seale, and Wanborough, in Surrey. Additional capital will be required; and it is proposed to adopt the sliding-scale. Authority will be sought to make agreements between the Company and the Frimley and Farnborough District Water Company and the North Camp and Farnborough District Gas Company, Limited, as to the purchase of the whole or part of such undertakings. In the Bill for which notice has been given, provisions will be contained in regard to the purchase of additional lands by agreement at Aldershot and Farnborough, in Southampton, and at Farnham, Frimley, Ash, Seale, and Wanborough, in Surrey. The Company will ask to be empowered to lay mains within the extended water limits, levy rates and charges, and apply their funds for the purposes above enumerated.

Aldrington Water.—The Aldrington Estate Water Company, Limited, have given notice of their intention to apply for the incorporation of a new Company, under the name of the Hove and Aldrington Water Company, with authority to supply water in the parishes of Aldrington and Hove, in Sussex, and to levy rates and charges therefor. The Memorandum and Articles of Association of the original Company are to be altered, and additional powers will be applied for.

Barry Urban District Council.—The Barry Urban District Council intend to apply for authority to extend their limits of gas and water supply so as to include for the former commodity the whole of the parish of St. Andrew's Major, and for the latter so much of that parish as is not contained in the water area of the Cardiff Corporation. It is proposed to carry out extensions of the water-works, comprising a boring on Dinas Powis Moor, and two conduits or pipe-lines. Among the provisions of the Bill to be promoted, is one in regard to the licensing by the Council of plumbers for gas and water purposes; and others as to borrowing money and levying rates and charges.

Bexhill Water and Gas.—Power will be sought by the Bexhill Water and Gas Company to obtain additional lands and waters for the purpose of extending their works and supply. They also intend to ask for authority to produce and supply electricity within the limits of the Bexhill Water and Gas Act, 1885, and acquire electricity undertakings of other companies, corporations, and persons. Additional capital will be required.

Bilston Improvement.—Authority will be sought by the Bilston Urban District Council for the confirmation of an agreement entered into between them and the Wolverhampton Corporation, or for the framing of another agreement, for the transfer to the Council of the existing rights of the Corporation in regard to the supply of water in part of the parish of Coseley, in Staffordshire. Money powers will be included in the Bill to be promoted.

Birmingham Corporation Water.—The Corporation of Birmingham wish to be empowered to make certain deviations of the aqueduct authorized by their Water Act of 1892, and to relinquish portions thereof; also to acquire lands and easements for the deposition of spoil and other purposes. The first deviation commences at Whitton, in the parish of Burford, and terminates at Caynham; the second commences at Kidderminster Foreign, and ends in the parish of Wolverley. Other purposes of the Bill to be promoted were mentioned in the JOURNAL last week (p. 1099).

Bournemouth Gas and Water.—The Bournemouth Gas and Water Company will apply for an extension of their limits of supply, and power to construct new gas and water works, manufacture and store gas, manufacture and convert residuals, appropriate waters, divert streams, &c. In the Bill to be brought in, provisions will be included in regard to the production and supply of electricity for lighting and other purposes; the selling and dealing in electrical and gas appliances and fittings; and the supply of gas for heating, cooking, and motive power purposes. Authority will be sought to acquire lands for the purposes of both the gas and water works; to purchase the undertaking of the West Hampshire Water Company; and to alter the charges throughout the extended limits. The districts for the supply of water by the two Companies are to be adjusted. Further capital will be required.

Brighton Corporation.—Notice has been given by the Corporation of Brighton of their intention to apply for sanction to the transfer to them of the undertaking of the Shoreham and District Water Company, and the extension of their limits of supply so as to include the Company's district and also West Blatchington. Additional works, consisting of three adits or headings, connected with each other, are projected. The usual powers granted to suppliers of water will be sought, as well as authority to apply the existing funds of the Corporation and raise more money for the above-named purposes. The Company will, of course, be dissolved upon the transfer of their undertaking.

British Gaslight Company, Limited.—The British Gaslight Company, Limited, intend to ask for power to expend further capital upon the enlargement of their Norwich station. Land contiguous to the Company's works at Thorpe is to be acquired for the purpose.

Burton-upon-Trent Corporation.—In a General Bill to be applied for by the Burton-upon-Trent Corporation, authority will be sought to enable them to manufacture, purchase, sell, hire, and let on hire appliances and fittings for the consumption and utilization of gas and electric energy for the purposes of light, heat, and power, and to recover charges therefor; also to enter premises and remove meters therefrom when a supply of gas or electricity has been discontinued. It is proposed to alter the date for making up the accounts of the electric light undertaking, and to appoint an auditor or auditors of the borough accounts, in addition to, or in substitution for, the auditors under the Municipal Corporations Acts. The Corporation will ask for an extension of their borrowing powers.

Cheltenham Corporation Gas.—Power will be sought by the Cheltenham Corporation to purchase, by compulsion or agreement, the undertaking of the Cheltenham Gas Company; maintain, continue, and enlarge the existing works; and supply gas in the parish and borough of Cheltenham, as well as in various adjacent parishes. The Company's Acts are to be amended and applied to the Corporation; and the Company will be dissolved. Special provision is to be made for the appointment of auditors of the accounts, and for dealing with any surplus income accruing from the gas undertaking after its transfer to the Corporation. Additional borrowing powers will be required.

Cheltenham Gas.—The Cheltenham Gas Company intend to apply for authority to consolidate their capital into one class of stock, and define the amount of dividend to be paid thereon; also to raise more capital. Additional lands will be required for extending the works; and it is proposed to construct a railway from them to the Midland Railway. In the Bill to be promoted, further provisions will be included as to the supply of gas and fittings, &c.

Chester Corporation.—The Corporation of Chester intend to apply for power to construct a weir or tidal dam and works in or across the River Dee, and for authority to prevent the pollution of the river above the weir. In the Bill to be promoted, there will be provisions for contributions being made to the expenses by the Chester Water Company and landowners who will be benefited by the works. It is proposed to give power to the Company to supply water to the public baths, &c., and to apply their funds and raise other money for the purposes specified. The Corporation will ask permission to borrow more money.

Colwyn Bay and District Gas.—The Colwyn Bay and District Gas and Lighting Company, Limited, desire to be dissolved and re-incorporated with power to supply gas in Colwyn, Colwyn Bay, Llandrillo-yn-Rhos, and Eirias. It is proposed to define the existing capital, and apply for authority to increase it. The present works are to be extended on lands to be purchased. The Company will ask to be empowered to manufacture and deal in stoves, machinery, and appliances, sell gas in bulk, and generally carry on their business with the usual rights and privileges.

Cowes Gas.—The Cowes Gaslight and Coke Company intend to apply for authority to dissolve the original Company, and re-incorporate it under the name of the Cowes Gas Company, or such other as may be determined, with powers of supply in the parishes of Cowes and Northwood. It is proposed to continue the existing, and construct additional works on the lands at present held, or on others to be acquired; to manufacture gas, residuals, meters, fittings, &c.; and to supply gas in bulk. Further capital will be required.

Darlington Extension and Improvement.—The Darlington Corporation contemplate carrying out a number of schemes for the improvement of the town; and they will apply for the necessary authority to enable them to do this. They wish for power to purchase compulsorily lands for the extension of the gas-works and for constructing electric light works, to manufacture and convert residual products, and to charge differential prices for gas. The electric lighting area is to be enlarged. Provisions are to be made with respect to the supply of water to certain specified classes of houses, and the prevention of waste and contamination. Meters and fittings may be provided by the Corporation, who will ask to be allowed to raise more money.

Derby Corporation Water.—The Derby Corporation intend to apply for authority to acquire, by compulsion or agreement, all or part of the undertaking of the Meerbrook Sough Company, and construct certain water-works, consisting of a pumping-station at Crich, a conduit or pipe-line from the sough to the station, a service reservoir at Crich, and other pipe-lines. It is proposed to extend the present limits of the Corporation, and to apply thereto existing enactments relating to water supply. Power will be sought to use for the above-named purposes money raised under the provisions of the Derby Corporation Act, 1890, and to obtain more on loan.

Drogheda Corporation.—The Drogheda Corporation have given notice of their intention to promote a Bill for the extension of their boundaries; and it will include provisions for the purchase, compulsorily or by agreement, of the undertaking of the Drogheda Water-Works Company, with the powers of supply and other privileges appertaining thereto. The Company will, of course, be dissolved. Authority will be sought to acquire lands and construct and maintain additional works; and for these and the general purposes of the business further borrowing powers will be asked.

Dublin Corporation.—The Dublin Corporation intend to apply for power to supply water to the Commissioners of the several townships of Pembroke, Kilmainham, Blackrock, Kingstown, Dalkey, Killiney and Ballybrack, Bray, Clontarf, and Drumcondra, and to prescribe the quantity of such supply per head of the population of such townships; also to provide that all water taken by the Commissioners shall be supplied by meter, and prescribe the price and the mode of payment by the Commissioners, or any of them, for such water; and further to provide for the recovery of any sums due to the Corporation in respect of this supply. In the Bill to be applied for, provisions will be included in regard to the testing of gas. These are noticed in another part of the JOURNAL.

East London Water-Works (Height of Supply).—The London County Council intend to apply for power to make further provision with respect to the supply of water by the East London Water-Works Company. The "further provision" in question is, in fact, to require the Company to keep water supplied constantly throughout their district, at such a pressure as will make it reach the top of the highest houses. It is proposed to ask for the repeal of so much of the East London Water-Works Act of 1853, or of any other Act relating to the Company, as excepts from incorporation therewith section 35 of the Water-Works Clauses Act, 1847; and likewise the repeal of section 60 of the East London Water-Works Act, 1853, and the incorporation with the Company's Acts of section 35 of the General Act of 1847. Any provisions of this Act which are not now applicable to the Company are to be extended to them, with or without modification. The Company are to be subject to penalties for failure to comply with any of the provisions of the intended Act; and it is proposed that the Council shall have power to sue for them. The Company's Acts of 1853, 1854, 1862, 1867, 1881, 1886, and 1894, and any others affecting them, are to be amended as far as may be necessary.

East Surrey Water.—The East Surrey Water-Works Company desire authority to purchase the undertakings of the Reigate and Kenley Water Companies, and extend their limits of supply. It is proposed to exclude portions of Banstead and Kingswood or Ewell from the area of the Sutton District Water Company; and provision will be made for purchasing works within the extended limits. The debenture stock of the Company is to be consolidated; and additional capital will be applied for.

East Warwickshire Water.—The East Warwickshire Water Company intend to apply for authority to construct new works, comprising a pumping-station and a reservoir at Bedworth, another pumping-station at Chilvers-Coton, and three conduits or pipe-lines; and to increase the rates and charges prescribed by their Act of 1882. Additional capital will be required.

Eastbourne Corporation Water.—The Corporation of Eastbourne have given notice of their intention to apply for an Act to empower them to introduce a new supply of water into the town. It is proposed to construct a pumping-station (to be called the Friston station) in the parish of Westdean, a reservoir on Warren Hill, and several aqueducts or pipe-lines, one of which will terminate in the Paradise reservoir of the Eastbourne Water Company. Power will be sought to purchase the Company's undertaking by compulsion or agreement; and their works are to be maintained and improved. The present limits of supply are to be extended, and regulations laid down for preventing undue consumption and waste. Underground and other waters are to be diverted and appropriated, and lands and easements purchased compulsorily. Money powers will be included in the Bill to be promoted.

Eastbourne Water.—The Eastbourne Water Company are desirous of extending their limits of supply; and they purpose asking Parliament to authorize them to do this, and also to construct new works, comprising pumping-stations in the parishes of Jevington and Friston, and various pipe-lines. Additional capital will be applied for. The Bill to be promoted will include provisions in regard to agreements between the Company and local authorities as to the supply of water in bulk, and the raising and application of funds.

Edinburgh Extension.—Application is to be made for an Act to extend the boundaries of Edinburgh so as to incorporate Leith and Portobello and certain other districts. It is proposed to dissolve the Gas Commission of the Edinburgh and Leith Corporations, and also the Edinburgh and District Water Trust, and vest their powers and property in the enlarged Corporation. The scheme comprises necessarily the acquisition of the undertaking of the Portobello Gas Company, and the extension of the limits of both gas and water supply. Authority will be sought to raise more money.

Falkirk and District Water.—The Falkirk and Larbert Water Trustees purpose making application for power to construct additional works, acquire lands, and impound water. The area of compulsory supply is to be extended and defined; and provision will be made for the levying of rates and charges, and the alteration thereof. Additional money will be required.

Fylde Water.—The Fylde Water Company intend to seek power to construct new works, consisting of an aqueduct or pipe-line from their existing filter-beds to the township of Blackpool, in the parish of Bispham. Application will be made for an extension of the limits of supply, and for authority to raise more capital.

Guildford Gas.—The Guildford Gas Company will apply for power to construct a line of railway to connect their works with the London and South-Western Railway; and to acquire lands for this purpose and for the manufacture and storage of gas and residuals. The Bill to be promoted will contain provisions for enabling the Company to produce and supply electricity for lighting, &c., construct and acquire works, rights, and machinery, and apply their capital to all or any of these purposes. The present capital is to be consolidated; and more money will be wanted.

Huddersfield Improvement.—The Huddersfield Corporation intend to apply for power to carry out a number of works for the improvement of the town; and among other things in contemplation is the purchase by agreement, and with the sanction of the Local Government Board, of the undertaking of the Longwood Gas Company, and the dissolution of that Company. Authority will also be sought to manufacture and store gas and residuals on further lands in Huddersfield. Provision is to be made that "notice shall be given to the Corporation before any pipes or fittings used for the conveyance or consumption of gas are covered over;" and the Corporation will ask to be empowered to "inspect and examine the same, and compel the removal of such as, from their natural construction or workmanship, would be likely to allow of an escape of gas," and to "prescribe the material, size, and strength of any pipes and fittings so to be used." Another matter for which sanction will be asked is the alteration of the position in the gas-works of the testing-place prescribed in section 28 of the Huddersfield Corporation Water-Works and Improvement Act, 1876. Additional borrowing powers will be applied for.

Huddersfield Water-Works.—The Huddersfield Corporation will apply for authority to lay a line of pipes from the Deer Hill reservoir to Shepley, at which place they purpose constructing a service reservoir. In connection with these works, additional lands will be required. The Corporation will also ask for an extension of time for the completion of the Blakeley reservoir, and also for additional borrowing powers.

Ilfracombe Gas.—The Ilfracombe Gas Company intend to apply for power to extend their limits of supply, acquire lands, and erect new works for the manufacture and storage of gas and residual products; such lands being situated at Hele, in the parish of Ilfracombe. It is proposed to construct a wall, embankment, or breakwater, and dredge and reclaim the foreshore at Hele. The Company will also seek power to enter into agreements with local authorities and other persons for the sale of gas in bulk or otherwise within or beyond their limits; and they will ask for authority to manufacture and deal in stoves, machinery, and other apparatus or appliances. They also

wish to be authorized to obtain power to produce and supply electricity for lighting and other purposes, and to construct and acquire works, rights, and machinery for this purpose. Additional capital will be required; and the shares of the Company are to be consolidated and converted.

Kent Water Board.—Application is to be made for the constitution and incorporation of a Water Board for the urban districts of Beckenham, Bromley, Dartford, Erith, and Bexley; and the rural districts of Bromley, Dartford, and Sevenoaks, in the county of Kent. Particulars in regard to this scheme were given in the JOURNAL last week (p. 1099).

Kirkcaldy and Dysart Water.—The Water Commissioners of Kirkcaldy and Dysart will apply for authority to construct new works in order to afford an additional supply of water for general purposes and for compensation. They comprise a reservoir, bye-wash, filter-beds, aqueducts, and pipe-lines in the parish of Leslie; a distributing reservoir, aqueducts, and pipe-lines in the parish of Dysart; and a reservoir and other works in the parish of Portmoak. Power will be sought to acquire lands, streams, and other property compulsorily or by agreement, and to supply water in and beyond the present limits. More money will be applied for; and permission will be asked to alter the existing rates and charges.

Lanarkshire (Middle Ward District) Water.—Authority will be sought by the District Committee of the Middle Ward of Lanark to abandon certain works authorized by the Lanarkshire (Middle Ward District) Water Act, 1892, and construct new works, comprising a number of reservoirs and pipe-lines. Power will be sought to acquire land and divert and appropriate water, to levy rates and charges, and to borrow money.

Leamington Corporation.—In a Bill of which notice has been given by the Leamington Corporation, provisions will be included for the purchase, by compulsion or agreement, of the undertaking of the Leamington Priors Gas Company, and the consequent dissolution of the Company—all their rights, powers, and privileges being transferred to the Corporation. Other provisions relate to water supply; extension of the Corporation's powers being required with respect to pressure, rates and charges, sale by measure, supply of fittings, the payment of rates by owners of small houses, and other matters. Further borrowing powers will be applied for.

London Sea Water Supply.—Notice has been given of an intended application to Parliament for power to form a Company for carrying out a scheme of sea water supply for London. The head works are to be at Lancing, in Sussex, where there will be a reservoir; another is to be at Bramber, and the various conduits will connect these reservoirs and bring the water to the Metropolis. The pipes will pass through Steyning, Horsham, Dorking, Leatherhead, Epsom, Wimbledon, Mitcham, Tooting Graveney, Streatham, Clapham, Battersea, Chelsea, Kensington, and the various parishes in and adjacent to the City. There will be sixteen conduits in all; and the London terminus is to be at the junction of Great College Street with Abingdon Street, Westminster. The Company will ask for powers to supply consumers with sea water in all the districts specified in the notice, as well as in all others through which their pipes pass. All the usual privileges granted to suppliers of water will be applied for.

Malvern Link.—The Malvern Link Urban District Council desire to extend the area under their control, and carry out some important works to improve the supply of water. These comprise a storage reservoir and filter-beds, in the parishes of Colwall and Mathon Royal, in Hereford and Worcester, and a number of conduits or pipe-lines connected therewith. Power will be sought to interfere with land springs, streams, roads, and other property; to supply water in the ordinary way and in bulk; to levy rates and charges, &c. Provision will be made for furnishing compensation water to streams; and also as to raising more money.

Manchester Corporation.—In a Bill to be promoted by the Manchester Corporation to enable them to carry out certain street improvements, provision will be made for the transfer to the Corporation of the townships of Partington and Carrington from the district now served by the North Cheshire Water Company, with powers of supply therein, and for the necessary amendment in this respect of certain Acts and Orders of the Company and Corporation respectively. Further borrowing powers will be included.

Matlock Bath Gas.—Authority will be sought by the Matlock Bath and Scarthin Nick Urban District Council to acquire the undertaking of the Matlock Bath Gas Company, Limited, and manufacture and supply gas in the district of the Council, in the urban district of Bonsall, and such parts of the urban district of Matlock and the rural district of Cromford as may be defined. The usual powers (including the inspection and testing of gas-fittings in new buildings) will be applied for, as well as permission to raise more money.

Newcastle-upon-Tyne and Gateshead Gas.—The Newcastle-upon-Tyne and Gateshead Gas Company intend to seek authority to acquire, by compulsion or agreement, certain lands for the enlargement of their works; and they will ask for an extension of the power to lay mains outside their district, so as to make a connection between the existing and the proposed new works. They wish to be empowered to enter into agreements with any other gas company for the sale in bulk to such company of gas manufactured by the Newcastle Company; and also with any local authority, body, or person for the supply of gas beyond the Company's authorized limits, and not within those of any other gas company. Additional capital will be required.

New River Company.—The New River Company have given notice of their intention to apply for power to carry out an extensive series of works, a general indication of which appeared in the JOURNAL last week (p. 1098).

North Wales Counties Lunatic Asylum (Water Supply).—The Visiting Committee of the North Wales Counties Lunatic Asylum, situate at Denbigh, intend to apply for power to construct waterworks, and to impound and abstract the waters of Llyn Bran, in the parish of Nantglyn, in Denbigh, and of the Afon Brenig stream. The Committee wish for authority to supply water to anybody within a "reasonable distance" of the proposed works, and to levy charges therefor; also to sell water in bulk. Power to apply the county fund, and other money to be raised, for the above-named purposes, will be included in the Bill.

Padiham Urban District Council (Water).—The Padiham Urban District Council desire an extension of time for the construction of certain works authorized by the Padiham Local Board Act, 1889; and also of the period within which certain rights, easements, and privileges, granted by an indenture dated Nov. 1, 1892, may be exercised. Additional money powers are to be applied for.

Porthcawl Water.—The Porthcawl Water Company, Limited, desire to be dissolved and re-incorporated, with power to continue and enlarge their existing works, supply water in Newton Nottage and Sker, levy rates and charges therefor, deal in fittings and meters, and generally carry on the business of a water company. The capital is to be defined and regulated.

Portsmouth Water.—The Borough of Portsmouth Water-Works Company intend to apply for power to carry out certain extensions, and to acquire additional lands and springs. It is proposed to alter the limits of supply so as to include parts of Chalton, Porchester, and Westbourne; and permission will be asked to apply the present funds and to raise more money for the purposes specified.

Redheugh Bridge.—The Redheugh Bridge Company propose applying for power to remove and re-construct their bridge; and they will ask that the Newcastle and Gateshead Gas and Water Companies may be required to subscribe towards the expenses; the right being accorded to them to lay down and maintain their pipes on the bridge, on terms to be agreed upon.

Sandwich Corporation Gas.—The Corporation of Sandwich purpose applying for authority to acquire land and construct works for the manufacture and storage of gas and residual products, and to supply gas within the borough; also to purchase, by compulsion or agreement, the undertaking of the Sandwich Gas Company. Power will be sought to maintain, continue, extend, enlarge, and, if deemed necessary, discontinue the existing works of the Company, sell the site and plant, and dispose of the proceeds; supply gas and fittings within the borough; enter into agreements with other authorities or companies as to the sale of gas in bulk; and levy rates and charges. The necessary borrowing powers will be applied for.

Sheffield Corporation Water.—The Corporation of Sheffield wish to be empowered to construct new reservoirs and carry out other works to improve their water undertaking. It is proposed to make one reservoir at Langsett, in the parish of Penistone, another at Bradfield, in the parish of Ecclesfield, and a third to be situated partly in Langsett and Hunshelf and partly in Bradfield; and, in connection therewith, construct various pipe-lines and incidental works. Power will be sought to divert and use the waters of the Little Don or Porter River, and its tributaries. Provision will be made for giving compensation, and for the supply of water to the Corporations of Barnsley, Rotherham, and Doncaster, with whom, either collectively or singly, agreements may be made. These Corporations are to be authorized to increase their rates and borrow money; and the Rotherham Corporation are to have power to consolidate their loans, and spread their repayment over an extended time. Costs were incurred in opposing the Barnsley Water Bill of last session; and provision is to be made for paying these and the costs of the application now to be made. Among the other matters contained in the notice are power to purchase lands, to charge to capital account the cost of meters supplied by the Corporation, to purchase the water undertaking of the Stocksbridge Urban District Council, to sell water to local authorities, and to raise more money on loan.

South Metropolitan Gas.—The principal portions of the notice given by the South Metropolitan Gas Company of their intention to promote a Bill for converting the capital and other purposes, were published in the JOURNAL last week (p. 1092).

Southwark and Vauxhall Water.—As mentioned in the JOURNAL last week (p. 1098), the Southwark and Vauxhall Water Company intend to apply for power to carry out an important scheme for the extension of their works. It comprises wells, adits, and two pumping-stations at Harefield; four storage reservoirs, each having a superficial water area of 250,000 square yards, at Walton-upon-Thames; and various conduits or pipe-lines passing through Harefield, Hillingdon, East and West Hillingdon, Uxbridge, Southall, Hayes, Norwood, Heston, Isleworth, Twickenham, Hampton, Hayes End, Walton, and West Molesey. Power will be sought to purchase lands and easements, to connect various portions of the works, to purchase or otherwise acquire water in bulk, &c. Additional share and loan capital will be applied for; and special provision is to be made as to the manner of raising it.

Staines Reservoirs.—Notice has been given of an intention to apply to Parliament for authority to form a Joint Committee of representatives of the West Middlesex, the Grand Junction, and the New River Companies to carry out the scheme of reservoirs at Staines which was prepared by Mr. W. Hunter and the late Mr. A. Fraser, and laid before the Royal Commission on Water Supply presided over by Lord Balfour of Burleigh. Particulars in regard to this scheme appeared in the JOURNAL last week (p. 1097).

Whittington Gas.—The Whittington Gas Company, Limited, desire to be dissolved and re-incorporated with change of name, and power to manufacture and supply gas in the parishes of Whittington and Brimington, in Derby; to sell gas in bulk for supply within or beyond the Company's limits; to make and sell meters, fittings, &c.; and to levy rates and charges. Provisions in regard to capital will be included in the Bill to be promoted.

Ystrad Gas and Water.—The Ystrad Gas and Water Company intend to apply for authority to construct new works, comprising two reservoirs, a pumping-station and tank, a service tank, and several conduits or pipe-lines. Additional capital will be required for the purpose.

Ystradyfodwg Urban District Council Gas and Water.—The Ystradyfodwg Urban District Council intend to apply for power to purchase, by compulsion or agreement, the undertakings of the Ystrad Gas and Water Company, and to carry them on with all the usual privileges. They will ask for authority to continue and maintain the existing water-works and construct new works, divert and use waters,

purchase lands, streams, &c. They will also seek authority to make bye-laws, rules, and regulations, and levy rates, rents, and charges. Additional borrowing and other powers will be sought. In the event of the consideration or value of the undertakings being determined by arbitration, the Arbitrators are to have regard, among other matters, to the following, or some of them: The adequacy and efficiency of the present sources of water supply, and of the reservoirs, filter-beds, filtration arrangements, wells, mains, conduits, pipes, machinery, and plant of the Company to meet present and future requirements; the probable necessity of the future introduction of a new source of supply of water, or new or improved water-works; and the deductions from any compensation claimed by the Company which may, in the opinion of the Arbitrators, be reasonably made in respect of any insufficiency of the present storage or filtration of the Company, or of the provision of supplementary supplies of water.

NOTICES OF APPLICATIONS TO THE BOARD OF TRADE FOR PROVISIONAL ORDERS (SESSION 1896).

Under the Gas and Water Works Facilities Act, 1870.

Amersham, Beaconsfield, and District Water.—The Amersham, Beaconsfield, and District Water Company, Limited, will apply for power to construct works and supply water in the parishes of Amersham, Coleshill, Beaconsfield, Chesham Bois, Chalfont St. Giles, Chenies, Seer Green, Penn, and Tyler's Green, all in Bucks. The works comprise a well and pumping-station at Amersham, a service reservoir at Coleshill, and various aqueducts or pipe-lines. Authority will be sought to raise money and levy rates and charges.

Ampthill Water.—Application is to be made by Mr. J. T. Green, of Ampthill, for authority to construct works and supply water in the parishes of Ampthill, Houghton Conquest, Barton, Higham, Gobion, Silsoe, Flitton, and Mauldon, in Bedfordshire, and in bulk or otherwise to local and sanitary authorities, companies, and persons within or beyond those limits. The principal works are to be situated at Barton-in-the-Clay, whence the water will be conveyed by a conduit, passing through most of the above-named places, to a reservoir at Ampthill, from which it will be distributed to the town. The usual general powers, as well as others in regard to the raising of capital, will be applied for.

Bishop's Waltham Water.—The Bishop's Waltham Water-Works Company, Limited, intend to apply for authority to extend the limits of supply defined by the Bishop's Waltham Order, 1894, so as to include the parishes of Corhampton, Curdridge, Droxford, Exton, Hambledon, Meonstoke, Shedfield, Swanmore, Soberton, Upham, Warnford, and West Meon, all in the county of Southampton. Additional share and loan capital will be required.

Burnham and District Water.—The Burnham, Dorney, and Hitcham Water Company, Limited, will ask to be authorized to continue and maintain water-works, open streets and roads, supply water by meter or otherwise, provide meters and fittings, and generally carry on the business of a water company, in Burnham, Dorney, Hitcham, and Farnham Royal. It is proposed to amend the provisions of the Slough Water-Works Act, 1875, and any other Act or Order relating to the Slough Water Company, and to define or modify their limits. Capital powers will be applied for.

Chester-le-Street and Pelton Gas.—The Chester-le-Street and Pelton Parish Lighting Company, Limited, intend making application for leave to extend the works at South Burns, Chester-le-Street. Power will also be sought to enable the Company to sell gas in bulk, supply gas fittings and appliances, and acquire and hold patent rights and licences in relation to the manufacture of coal tar, coke, pitch, and all other residual products. The capital of the Company applicable to these purposes is to be fixed and defined, and authority to raise more money will be sought.

East Huntingdonshire Water.—The East Huntingdonshire Water Company will apply for power to construct additional works, consisting of a well and pumping-station at Bassingbourn, in Cambridge, and an aqueduct or pipe-line starting therefrom and ending at Bourn in a junction with the Company's present main. The limits of supply are to be extended. The Company will ask for an alteration and definition of existing capital, and power to raise more money.

Fort William Gas.—Mr. Hugh Mayberry, of Glasgow, intends to apply for power to continue and maintain the gas-works now existing at Fort William, in the county of Inverness, and to supply gas, meters, fittings, &c. The limits of supply are to be defined; and power will be sought to lay mains and pipes, break up streets, and levy rates and charges. The existing capital is to be defined and regulated.

Hemel Hempstead Water.—The Hemel Hempstead Water-Works and Laundry Company, Limited, will ask for authority to maintain and continue their existing works, and construct new ones. The Order to be applied for will define the limits of supply, and contain provisions as to the levying of rents, rates, and charges. The capital is to be regulated and defined; and power to raise more money will be sought.

Laindon Gas and Water.—Application will be made for authority to incorporate a Company to construct gas and water works, and manufacture and supply gas and supply water in the parishes of Laindon Hills, Lee Chapel, Laindon, Little Burstead, and Great Burstead (including Billericay), in Essex. The usual powers will be sought to lay mains and pipes, break up roads, levy rates and charges, and supply fittings and apparatus.

Maidstone Gas.—The Maidstone Gas Company intend to apply for an enlargement of their existing borrowing powers so as to be enabled to raise by loan an amount equal to one-third of the entire share capital, including premiums, instead of the sum now authorized. The provisions of the Company's Acts of 1858 and 1880 are to be altered in those parts which are inconsistent with the objects of the intended Order.

Maidstone Water.—The Maidstone Water Company purpose applying for authority to consolidate their existing capital, and to raise further money by the issue of shares or upon debentures.

Matlock Bath Gas.—Application is to be made by the Matlock Bath Gas and Coke Company, Limited, to maintain, continue, and enlarge their existing works, and manufacture and supply gas within the urban districts of Matlock, Matlock Bath, and Scarthin Nick (except such parts as are now supplied by the Matlock and District Gas Company, Limited), and Bonsall, and the rural district of Cromford, all in Derbyshire; also to sell gas in bulk. Further capital will be applied for.

Oswestry Gas.—The Oswestry Gaslight and Coke Company, Limited, will apply for power to maintain and continue their gas-works, and manufacture and supply gas in the parishes of Oswestry (urban and rural), Selattyn, and Whittington, in Shropshire; to make agreements with local authorities and others, and sell gas in bulk for use beyond those limits; and to supply gas fittings, apparatus, &c. The existing capital is to be defined; and provision will be made for increasing it.

Settle Gas.—The Settle Gas Company, Limited, will seek power to maintain and continue their existing gas-works between Settle and Giggleswick, in the West Riding of Yorkshire, and to supply gas in bulk to any local authority or gas company for resale and distribution in adjacent districts beyond the locality supplied by the Company. They also seek to be authorized to supply gas in the whole of the townships of Settle and Giggleswick; and to have conferred upon them the usual powers in reference to gas-stoves, cooking apparatus, and all other articles connected with the consumption or use of gas. The existing capital is to be defined and regulated; and such provisions as may be deemed expedient in regard thereto will be applied for.

Tilehurst, Pangbourne, and District Water.—The Tilehurst, Pangbourne, and District Water Company, Limited, intend to apply for authority to extend their limits of supply to certain other contiguous places in Berkshire and Oxfordshire; and they will ask for additional capital for the general purposes of their undertaking.

Under the Electric Lighting Acts, 1882 and 1888.

Applications will be made under the above-named Acts for powers in regard to the supply of electricity for lighting and other purposes in the following places: Allerton, Ashton-on-Mersey, Ambleside, Bangor, Bath, Battersea, Bray (Ireland), Bristol (Suburbs), Colwyn Bay, Cork, Cowes, Devonport, Folkestone, Gloucester, Godalming, Great Berkhamstead, Great Crosby, Huddersfield, Huyton-with-Roby, Ipswich, Keswick, Kettering, King's Lynn, Kingston, Lincoln, Liverpool, London (South), Manchester, Margate, Merthyr Tydfil, Middleton, Newington, Newmarket, Pembroke, Prescot, Queenstown, Rathmines, and Rathgar, Sale, and Wells.

NOTICES OF APPLICATIONS TO THE LOCAL GOVERNMENT BOARD (SESSION 1896) FOR PROVISIONAL ORDERS.

Under the Gas and Water Works Facilities Act, 1870, and the Public Health Act, 1875.

Driffield Gas.—The Urban District Council of Great Driffield will apply for authority to acquire the undertaking of the Driffield Gas Company, continue and extend the existing gas-works, manufacture and sell gas and fittings, and generally carry on the business of gas supply. Power to borrow money will be sought.

Sandwich Corporation Gas.—The Sandwich Corporation intend to apply to the Local Government Board for authority to purchase by agreement the undertaking of the Sandwich Gas Company, and carry it on with all the privileges usually conferred on suppliers of gas. The limits of supply are the borough of Sandwich; but the Corporation will ask to be authorized to sell gas in bulk to parties outside. An extension of the borrowing powers of the Corporation will be required.

South Molton Gas.—The Corporation of South Molton purpose making application for power to purchase the undertaking of the South Molton Gas Company, to manufacture gas and residuals, and generally carry on the business of gas supply in and beyond the borough. Authority will be sought to raise money for the above-named purposes on the security of the rates.

Willson and Ellis's Improved Metallic Carbides.—As bearing more or less directly upon the gas industry, notice may here be taken of an announcement that application is to be made to Parliament next session for an Act to antedate, continue, and confirm letters patent granted or to be granted in respect of the following applications: Application for letters patent, bearing date the 1st day of September, 1894, and numbered 16,705, by Thomas Leopold Willson, Electrical Engineer, of No. 19, West Thirty-Eighth Street, New York, for the term of fourteen years, for an invention of "Improved metallic carbides for use in the production of acetylene, and means for producing the same." Application for letters patent, bearing date the 27th day of August, 1894, and numbered 16,342, by George Beloe Ellis (a communication from Thomas Leopold Willson), for a term of fourteen years, for an invention of "Improvements in the production of metallic carbides, and of illuminating gas derived therefrom." Authority will be sought for the Comptroller-General of Patents, Designs, and Trade Marks to antedate these patents to Feb. 28, 1894, the date of the application in the United States; and after this has been done, the patents are to be valid as from that date.

The East London Water Company's Reservoirs.—The great reservoir for filtered water which the East London Company have been constructing at Hagger Lane, Walthamstow, is rapidly approaching completion. It was reported some time ago that it had sustained serious damage; and, considering the magnitude of the work, the report was a somewhat serious one. It is a large brick and concrete reservoir capable of holding 8 million gallons of water; and it is to be arched over. Three or four hundred men have been engaged on the construction of it ever since the spring. What really happened was that a small portion of one of the walls slipped on its foundation. Very little injury was caused; and what was done has been repaired.

LEGAL INTELLIGENCE.

HIGH COURT OF JUSTICE—QUEEN'S BENCH DIVISION.

Wednesday, Nov. 27.

(*Before the* LORD CHIEF JUSTICE *and a Special Jury.*)

The Fareham Electric Light Company, Limited, v. The Fareham District Council.

In this case, the plaintiff Company sought to recover damages from the defendants in respect of an alleged breach of a contract by the latter to purchase the undertaking of the Company at a price to be fixed by arbitration.

Mr. ROBSON, Q.C., and Mr. R. M. BRAY appeared for the plaintiffs; Sir E. CLARKE, Q.C., Mr. CHANNELL, Q.C., and Mr. GLEN represented the defendants.

Mr. ROBSON, in opening the case, said the Fareham District Council were the successors of the Fareham Local Board, whose liabilities they had taken over. The Fareham Electric Light Company was a small Company incorporated in 1890 for the purpose of supplying electric light to the district of Fareham; and it was composed of persons resident and interested in Fareham. Prior to the formation of the Company, the town was lighted by gas; but there had been very considerable complaints, and there was great feeling in the district with regard to the way in which both the public and the private lighting was carried out, and as to the desirability of introducing the electric light. In June, 1890, the Company entered into a contract to supply the Local Board with the electric light for three years. The terms were very low—being only 3d. per unit; whereas they were charging 8d. per unit to private consumers. In February, 1892, there was an inquiry by the Board of Trade in regard to obtaining a Provisional Order; and one was granted in which there was a clause authorizing the Company to transfer their business to the Local Authority. There was also a clause whereby the undertakers were, within a period of two years from the granting of the Order, to remove certain overhead wires and put them underground. These wires were not taken down by the stipulated time, nor were they removed when the Board agreed to purchase the undertaking. During the first three years, the working of the Company resulted in a loss; and in 1894, the Directors came to the conclusion that, unless they could get more support from the public, and a larger sum from the Local Board for the supply they were furnishing to them, they would not be justified in going on. They accordingly wrote to the Board, offering to sell the undertaking by valuation or at cost price. Nothing was done on this offer; and on the 28th of May, 1894, the Company informed the Board by letter that, unless something was done, they would have to apply to the Board of Trade for leave to abandon the Order. On the 4th of June, the Board decided to buy for a fixed sum; and on the 15th, their Clerk transmitted a copy of that resolution to the Company. The sum fixed was £5000; the Company to remove the overhead wires and erect a new engine at a cost of not more than £1000. Several meetings of the ratepayers in Fareham were held on the question of whether the Company's undertaking should be purchased; the feeling in favour of a purchase, if any, by valuation, and not at a fixed sum, prevailing. On the 16th of August, the contract in question was entered into, whereby it was agreed that the Company should sell and transfer, and the Local Board should purchase, the defendants' undertaking, at a price to be ascertained by the valuation of it as a going concern—the sum to be fixed by arbitration. The most important clause in this contract was that the Company should use their best endeavours to obtain from the Board of Trade their approval of the transfer of the undertaking, and that the Board should be equally diligent in trying to obtain from the Local Government Board their approval of the transfer, and their sanction to the borrowing by the Board of the amount required for the purchase. This was the contract which the plaintiffs alleged that the defendants had broken, because they had not used their best endeavours to obtain the consent of the Local Government Board, but, on the contrary, had done their utmost to cause it to be withheld. The Arbitrators appointed had assessed the value of the undertaking at £4886.

Mr. *J. Blake*, the Manager of the Company, was called, and proved the correspondence which had taken place between the parties, and also the contract in question. Witness was a member of the Local Board; but, except by inadvertence, he had not voted at the Board on the question of acquiring the electric light undertaking.

In cross-examination, he said that three of the members of the old Board who were in favour of the electric light had not since been re-elected.

Thursday, Nov. 28.

On the case being resumed to-day,

Sir E. CLARKE said his contention was that, if the Local Board had laid all the facts of the case before the Local Government Board, there was no probability of the latter giving their sanction to the contract. No doubt there had been a breach of the agreement on the part of the Board to use their best endeavours to obtain the requisite consent; but this was a question of damages.

The LORD CHIEF JUSTICE said he proposed to ask the jury whether they believed that, if the existing Council had represented to the Local Government Board that they wished the contract to be carried out, there was any doubt that that Board would have given their consent; or, if they had told the Local Government Board that they thought the contract was not an advantageous one, but that if they broke it they would incur heavy damages, whether the Board would not, in those circumstances, have given effect to the contract.

Sir E. CLARKE said the Local Government Board, in guarding the interests of the ratepayers, would have protected them by refusing to allow an expenditure to be incurred of which they disapproved.

The LORD CHIEF JUSTICE remarked that the carrying out of undertakings entered into in good faith by public bodies was a very important consideration.

Sir E. CLARKE said the Board carried through the contract in known disobedience to the views of the ratepayers whom they were supposed to represent.

Mr. ROBSON said he should submit, as a matter of law, that his learned friend was not entitled to lead evidence to any of the points he had taken. Sir E. Clarke had said that he did not charge dishonesty in the sense of actual fraud; but that the Local Board took advantage of an accidental position in order to carry out a contract that was not for the benefit of the ratepayers.

The LORD CHIEF JUSTICE said, if the parties agreed that the jury should be discharged, he would give his ruling on the point, so that the matter might go straight to the Court of Appeal.

This course was not assented to.

Mr. *Blake* was then cross-examined as to his interest in the Company, and the meetings which had been held in the district in regard to the advisability of purchasing the electric light undertaking.

Sir E. CLARKE, for the defence, said he would not deny that a contract had been entered into whereby the Local Board were to use their best endeavours to obtain a loan for the purpose of purchasing the electric light undertaking. But the purchase was to be conditional on the sanction of the Local Government Board being obtained; and the jury would have to consider whether, in all the circumstances of the case, it was probable that that Board would have sanctioned such a loan. The contract was drawn up in such a way that, if the Local Government Board had attached any onerous conditions to the granting of the loan, such as its speedy repayment, the Board could have legally declined to carry out the contract.

The LORD CHIEF JUSTICE then summed up the case.

After a brief deliberation, a verdict was returned for the plaintiffs for £3800.

His LORDSHIP granted a stay of execution until the 15th of January next, with a view to an appeal.

CAMBRIDGE COUNTY COURT.—Wednesday, Nov. 20.

(*Before His Honour Judge* BAGSHAWE, Q.C.)

The Charges for High Water-Services at Cambridge.

Several water-rate cases instituted by the Cambridge Water-Works Company were heard to-day. The first (against Mr. A. A. Walker) was the most interesting; the facts being briefly these: The action was for two quarters' water-rate. The first item, 10s. 6d.—the percentage on the annual value of the house—was not disputed, nor was a charge of 2s. 6d. for the first water-closet; but the next item, 1s. 6d. for a second water-closet, was. Then "the first high service, 2s. 6d." was disputed as to charge; and the second and third high services were disputed *in toto*. The expression "high service" was defined by the Company's Act as a delivery of water, other than for a water-closet, at an elevation of more than 10 feet from the ground. The Company's practice had been, where they had to deliver above 10 feet from the ground, unless the water was used exclusively for a bath or water-closet (which were both charged for separately), to make high-service charges.

Mr. J. F. P. RAWLINSON appeared for the plaintiffs; Dr. COOPER represented some of the defendants.

Mr. RAWLINSON, having stated the case as above set forth, submitted that the test of a charge for high service was simply this: Did the Company supply from the mains into the consumer's tap, or whatever it was, at an elevation of 10 feet above the level of the ground? He explained that, in this instance, there were three deliveries above the 10-feet level; and therefore they charged for three high services. Regarding the charge for the second water-closet, the claim was made under section 37 of the Company's Act. The closet was not under the same roof as the house, but it had a roof that touched the house. It was supplied by the Company with water; and, Counsel remarked, from a common-sense point of view, surely they ought to be paid for it.

George Kirkup, one of the Company's inspectors of fittings, stated that there were two taps in the kitchen; two on the first floor over a hand-basin; and two in the bath-room over a hand-basin. The cold-water taps branched from the Company's rising main, which passed on to the cistern in the roof.

In cross-examination by Dr. COOPER, witness said there was only one rising main, which was first tapped in the scullery.

His HONOUR, after consulting a plan in conjunction with Counsel on both sides, said the chief point would be this: Was the pipe down to the point where it supplied the sink continuous with the rising main? If it was continuous, and was not interrupted by any tap or valve, from the main, then the point the Company made was that as long as the water was in the pipe it was in the Company's custody, and when it was out of the pipe it was "delivered" within the meaning of the Act.

Mr. RAWLINSON said that was his contention.

Mr. *W. J. Gwenfelt*, a clerk and draughtsman in the service of the Company, said he had been to the defendant's house, and had found that one water-closet was on the first floor, and the other just outside the door leading into the scullery. The roof of the closet touched the main building.

Dr. COOPER: If it was considered expedient or advisable, could not this water-closet be removed without affecting the scullery or the main building?

Witness: It need not affect what you may term the main building. But it would certainly affect the scullery; and that is a part of the main building.

His HONOUR said he thought he had all the material facts.

Dr. COOPER, in the course of his argument for the defendant, declared that it was a matter of notoriety that since the Company came into existence, up to within a few months ago, they had never made a claim for high service. The Act said the delivery at high service should mean, and should be considered as being, a delivery of water, other than for a water-closet or a bath, at an elevation of 10 feet above the pavement. Therefore the delivery for a water-closet or bath was not high service, unless there was a distinct and separate service on the part of the Company. There was no distinct and separate high service to the tap in the lavatory. The water which was discharged into the cistern was for the purpose of obtaining hot water for the bath, for which a charge was already made. Respecting the question of the second closet, the words of the section were "if in

any house;" and Counsel submitted that the second water-closet could not be said to be "in" the house, and therefore should be included in the domestic service.

Mr. RAWLINSON rose to reply to the argument advanced by Dr. Cooper; but

His HONOUR said he need not trouble him upon any of the points raised. His opinion was that the second water-closet was used for the purposes of the house, and was part of the same structure; and as to the rising main, in his opinion, at every point at which water was drawn off it was "delivered." His judgment was for the amount claimed, less 2s. 6d., with costs and Counsel's fee.

The other cases—in one of which the question as to high service was again raised—were all decided in the Company's favour; but they did not contain any other points of general interest.

Newhaven and Seaford Water Company.—The annual meeting of this Company was held last Tuesday, when it was reported that the result of the twelve months' working was a profit of £1150. The balance available for division was £1155; and the Directors recommended a dividend at the rate of 5 per cent. per annum. After paying this, a balance of £378 would remain, of which it was proposed to place £250 to the reserve fund. The report was adopted.

Incandescent Gas-Burners for Street Lighting.—There cannot now be the slightest doubt as to the success of incandescent gas-lamps for street lighting purposes in numerous towns; but they will not answer in Cardiff—at all events the Borough Engineer (Mr. W. Harpur) says so. At the last meeting of the Lighting and Electrical Committee of the Corporation, he reported upon a small installation of five of the lights that had been fitted up in Charles Street, and said he did not hesitate to give it as his opinion that they were not suitable for outdoor lighting. They were so delicate that, if anything went wrong with them, they could not trust a lamplighter to interfere with them, or set them right, but had to send a fitter. Only a short time ago, on a rather stormy night, two out of the five lamps could not be lit. The Cardiff Corporation are the owners of the electric lighting works.

The Average Meter Question in Canterbury.—At a meeting of the Canterbury Town Council last Wednesday, a letter was read from the Gas and Water Company declining to accept the Council's terms for fixing meters in various parts of the city, testing the illuminating power of the gas, and imposing a penalty of 1s. for every lamp found with the light extinguished when it should be burning—a rebate also to be made when the lamp-meters showed that the gas estimated had not been consumed. The Company declined to fix and maintain twenty meters at their own expense; and as to testing the gas, they insisted on receiving the two hours' notice allowed under their Act. The Town Clerk was directed to inform the Company that, if they would pay for ten of the meters, the Council would pay for the other ten; and if terms could not be agreed upon in respect of the meters and the other questions, the arbitration clauses of the Gas-Works Clauses Act of 1871 would be put into operation.

The Wentwood Water Scheme of the Newport Corporation.—At the meeting of the Newport Corporation last Tuesday, Colonel Lyne referred to an impression which had got abroad that the Wentwood water scheme had been abandoned by the Water Committee. He declared that this was not the case. The works had only been suspended; and he believed that ultimately they would be carried out. The Council subsequently went into Committee for the purpose of further dealing with questions affecting the scheme. It is reported that a deputation from the Committee have had an interview with Mr. J. Young, of Glasgow, the contractor for the new works, and have ascertained that he is willing for £60,000 to relinquish the contract, the total amount of which was about £90,000. For the £60,000, Mr. Young would leave the plant already on the ground, and afford the opportunity for the Corporation, by entering into other engagements, to complete the work, or vary it in any way which might hereafter be decided on. Mr. Young has, it is understood, been settled with.

Lecture on Coal Gas.—At a recent meeting of the Primitive Methodist (First Circuit) Improvement Society in York, a lecture on "Coal Gas" was given by Mr. J. H. Hill, the superintendent of fittings of the York Gas Company. It was accompanied by experiments, and was attentively listened to by a numerous audience. The preparation of coal gas was shown in operation and by diagrams, after which the various gases constituting it, in both its unpurified and purified state, were exhibited, and their characteristics indicated. One attractive feature of the experiments was the production of acetylene gas. The lecturer stated that efforts had been made to use acetylene as an enricher for gases of a poor quality; but the high price of calcium carbide, from which it was produced, precluded this at present. Doubtless cheapening would take place in time; and thus another means of improving gaslight would be placed in the gas manufacturers' hands. The various properties of coal gas, such as its explosiveness, its heating power, &c., were also noticed. At the close, a vote of thanks was passed to Mr. Hill for his interesting and successful lecture.

Fire in a Purifier at the Poplar Gas-Works.—A highly exaggerated account appeared in several of the London evening papers last Wednesday of an accident, attended by some personal injuries, which had occurred about seven o'clock in the morning at the Poplar works of the Commercial Gas Company. One of the halfpenny prints came out with the startling heading: "Gas Explodes and Injures Twenty-Four Men;" and anyone might have supposed, on seeing this, that the entire works had been wrecked. We learn, however, that the actual facts are briefly as follows: Owing to the recklessness on the part of the workmen themselves, in having lighted a gas-jet within 6 feet of a purifier-cover they were lifting, the gas left in the purifier after being shut off lighted, and burnt round the edges of the lid, but without explosion. As the purifier is 40 feet square, along the edge to which the current of air drew the gas there was for a few seconds a considerable flame, which slightly burnt five of the nearest men about their heads and hands. They walked to the Poplar Hospital to receive attention; and four of them were kept for the night. There was not the slightest damage to the purifier or the building, or to any of the appliances.

MISCELLANEOUS NEWS.

ORIENTAL GAS COMPANY, LIMITED.

The Ordinary General Meeting of this Company was held last Wednesday, at the Offices, Finsbury House, Blomfield Street, E.C.—Mr. J. BLACKET GILL in the chair.

The SECRETARY (Mr. H. J. Luff) read the notice calling the meeting; and the Directors' report and accounts were then submitted.

The CHAIRMAN, having welcomed the shareholders to the new offices, said the report entered so fully into the history of the Company during the past year that he did not think there was very much that it was necessary for him to dwell upon. With regard to the accounts, he found that they had spent more for coal. This arose from two causes, one of which was satisfactory, the other perhaps not so much so. In the first place, they had carbonized more coal to meet the demand for gas; but, on the other hand, he was sorry to say the price of coal had increased considerably in India, and their contracts for the next three years were somewhat in excess of the price they had previously paid. In the twelve months, they had received £1564 more in gas-rental, which was an increase of about 1¾ per cent., and was fairly satisfactory. They had also realized a further £1425 from residuals and fittings. There had been 185 new consumers, representing 625 additional burners, and 117 new lamps connected. All this, he thought the shareholders would agree, was gratifying. Unfortunately, the increased profit, as the report informed them, was almost swept away by £2402 extra loss on exchange; making the total of that item close upon £29,000. They had been enabled to put £1500 more to the reserve account. He desired to draw attention to the fact that this was a reserve account, because he remembered that, after the last meeting, upon some shares being offered for sale, it was stated that the Company had a good reserve fund. He wished that it were a fund invested outside the works; but the money was used in the works, and therefore it could only be called a reserve account. The Directors recommended the payment of a final dividend of 4½ per cent., which made the dividend for the past year the same as in the preceding year—viz., 8 per cent. per annum, after paying which they carried forward £2578 more than on the last occasion. Under these circumstances, he thought the shareholders would agree that the position of the Company was satisfactory. The private lighting showed a small increase; and it was now something like 41 per cent. of the whole of the lighting business. Their Manager (Mr. D. C. Niven) informed them that electricity had not made much progress in Calcutta. During the year, there had been a meeting there of electrical experts, who had decided that it would be unwise to lay electric mains in the streets; and they were consequently going to have overhead wires. He (the Chairman) thought that possibly the shareholders might regard this with a little satisfaction; it was certainly a slight advantage to them. They had, however, their Manager told them, a permanent and powerful rival in oil, which was unfortunate. One particularly satisfactory item in the accounts was that they had been able to pay off £7250 of debenture debt. He imagined the best thing they could do to strengthen their position was to repay all the debentures as they fell due. It was the policy of the Directors to keep paying them off; and he hoped, when their agreement expired, they would be free from debenture debt. He was sure the shareholders would approve of this policy. The incandescent gas-light, he thought, had been of some advantage to them in Calcutta. It might, and no doubt did, lessen the consumption of gas to some extent; but it was a strong opponent of electricity. The Incandescent Gaslight Companies seemed to be having a pleasant time among themselves; and he hoped the time would come when gas companies would obtain some of the advantages at a little less cost. However, the light was a useful handmaid to gas. He was sorry to say that, since the report was printed, an unfortunate accident had happened at their works. Three guide-wheel brackets of their larger gasholder had broken in the middle of the night. Their Manager was aroused by hearing a noise; and he found that the holder had got out of gear, and a quantity of gas had escaped. However, it really meant only a slight loss; and they might congratulate themselves that no lives were lost, and no further damage done to the works. They might also congratulate themselves on the fact that they had a Manager who was equal to an emergency of this sort. The Directors knew it had caused Mr. Niven a considerable amount of anxiety. They were, however, glad to learn that the holder was again at work; and though possibly it would require a little more repairing, he was glad the worst had passed. He was pleased to have this opportunity of bearing testimony to the ability their Manager had shown on many occasions, and to the thorough trustworthiness and willingness with which he entered into their interests, and strove to promote them. The agreement with the Municipality for public lighting expired in May, 1901. No further steps had been taken on either side as to a renewal; but they would be most happy at any time to meet the Municipality, to discuss the matter in a perfectly friendly manner. More than this, it would probably not be wise for him to say. A somewhat unique event had happened during the past year. One of the Directors (Mr. R. Miller) visited Calcutta on business of his own; and he very kindly spent some time in inspecting the Company's works, and making himself acquainted with their affairs there. No doubt Mr. Miller would tell the shareholders what he thought of their business. The Directors were very glad to have him among them, as his Indian experience was of great value to them. Their Sub-Engineer (Mr. Bertram Ellis) had been home on sick-leave this year; and the Directors had taken advantage of this to consult with him on various matters. The Company were in a fairly prosperous position; and were it not for the unfortunate rupee, they would be able to show a much better state of things. Those who took a pessimistic view told them that exchange was going to be much worse; and those who took an opposite view said it was going to be better. There was no doubt exchange was a great drag on the Company; but all they could do was to bear it in a philosophical manner, and to do all in their

power to increase the business so as to counterbalance this great disadvantage as much as possible. He concluded by moving the adoption of the report and accounts.

Mr. N. E. B. GAREY seconded the motion.

Mr. J. COPPEN suggested that, as the contract with the Municipality would expire in 1901, the time had arrived when the Directors should approach the authorities with the view of obtaining a fresh one. Supposing that they did not succeed in getting a new contract, he presumed they would be started off "bag and baggage."

The CHAIRMAN: No, no. We have the private business, which is 41 per cent. of the lighting. We do not intend to lose that; and, indeed, there is no chance of losing it.

Mr. J. P. MOORE asked what would be the loss to the Company in the event of the Municipality not renewing the contract?

The CHAIRMAN replied that 59 per cent. of the lighting came from the Municipality. The loss of this would, of course, be a serious thing; but there was no reason to anticipate losing it. Of course, they must take into account the residuals, which produced a considerable amount.

Mr. E. T. E. BESLEY, Q.C., hoped the Board would not approach the Municipality. He always thought that it was unwise to appear to be eager to enter into a contract; and, in his opinion, it was far better policy to "lie low," and not urge the Municipality. No Municipality would agree to a contract six years in advance, or, if they did, they would want the other party to give up something. Therefore, he thought it would be better to wait until they were nearer the end of the contract before taking steps in the matter.

The CHAIRMAN, replying to Mr. Whitley, stated that, in making up their accounts, they took the rupee at its nominal value of 2s.; and the difference between the 2s. and the current value was included in the item of loss on exchange (£28,939).

Mr. H. D. ELLIS explained, with reference to the reserve account, that their stocks, which now stood at something like £20,000, were provided partly out of the money placed to that account. If they had not this reserve account, they would have to raise capital with which to buy stocks.

The motion was then carried.

The CHAIRMAN, having moved the declaration of a dividend of 4½ per cent., making 8 per cent. for the year, free of income-tax, stated that some time ago the Company had a Local Committee. One of the members, however, died; and the one who was left resigned. The Directors had, in consequence, been considering the best mode of securing an audit of the Company's accounts abroad; and they had come to the conclusion to employ a first-rate firm of accountants in Calcutta, who would forward a monthly statement. The suggestion that this should be done emanated from their Manager; so that the arrangement was very satisfactory.

Mr. GAREY seconded the motion, which was agreed to.

Mr. R. MILLER said the Chairman had mentioned that he (the speaker) had visited, at the beginning of the year, the scene of the Company's operations. While in Calcutta, he took every opportunity of going over their works. Although he did not interfere at all with the technical matters connected with the business, he took the greatest possible interest in satisfying himself as to the personality of those in charge; and he could assure the shareholders that their interests in Calcutta were not only in technically capable hands, but in the hands of a man who was devoted every hour to their service. The small untoward event the Chairman had alluded to was an instance of the value of such a man to the Company. Their Manager was exceedingly attentive to their business. He was desirous of spreading the private demand for gas, as distinct from the Municipal demand, to its utmost. As to the works, of course he could not give an opinion as an expert; but, speaking with limited knowledge of such matters, he should say they were in an extremely satisfactory condition.

The retiring Directors (Messrs. Garey and Ellis) were re-elected; and the Auditors (Messrs. Eastman and Savage) were re-appointed.

A vote of thanks to the Chairman and Directors for their efficient services was passed; and the thanks of the shareholders were also accorded to the Engineer, Assistant-Engineer, Secretary, and the staff at home and abroad.

The proceedings then terminated.

SINGAPORE GAS COMPANY, LIMITED.

An Extraordinary Half-Yearly Meeting of this Company was held last Thursday, at the Cannon Street Hotel, E.C.—Mr. SAMUEL SPENCER in the chair.

The SECRETARY (Mr. R. M. Christie) read the notice calling the meeting; and the Directors' report and the accounts for the half year ending June last were taken as read (see *ante*, p. 1041).

The CHAIRMAN, in moving the adoption of the report and accounts, said it was with the deepest regret that the Directors had not a better state of things to submit to the shareholders; the past half-year's working having really been the worst it had ever been their lot to present to them. When before the shareholders six months ago, the Directors thought they were justified in saying that they might hope they had come to the end of what might be considered the climax of a series of bad half-years' working; but, to their great regret, the past half year had closed with something worse, as, notwithstanding all their efforts, the profits had come out next to nothing. This arose from the further loss due to the very low rate of exchange, amounting to a difference of ¾d. per dollar less than anything they had ever before experienced, added to which the cost of coal came out to £1 14s. 6d. per ton, although it was bought at an average rate of £1 1s. 7d. sterling. But through the low rate of the dollar, the price into the stores came to the former figure, which was a higher price per ton (with one exception) than they had had in the past three years. The increase in the loss on exchange and the price of coal together amounted to £1350 more than in the previous half year. The profit on fittings was also reduced to the extent of £400, arising, the Board thought, entirely from the absence of business in this department. Besides, they had, unfortunately, had a very poor return from the coal carbonized, in consequence—so their Manager (Mr. H. W. Smith) informed them—of their stokers leaving to return to China; and the new men engaged in their places, having to learn their work, had not produced so much gas per ton by something like 1000 cubic feet. Under these most disappointing circumstances, it was satisfactory that they had not made a loss; and the Board were thankful the position was not worse. When they met six months since, the Directors had every confidence that the working for the past half year would put them in a position to recommend a dividend; but owing to the disastrous results he had alluded to, they did not do so. They preferred leaving the matter in the hands of the shareholders, and would be pleased to fall in with any decision at which they might arrive. The balance would admit of a dividend at the rate of 2½ per cent. per annum; and a sum of £270 would remain to be carried forward. So far as the Directors could judge, with the improved rate of exchange now ruling, and more satisfactory results in the retort-house, they must have a better return this half year; and in that case, they could maintain, if not increase, the dividend at the next meeting. At the same time, if the shareholders were disposed to forego a dividend on this occasion, it would put the Directors in a much better position for the current half year, and enable them to clear off an old debt of about £950, which was incurred some years ago in helping to pay the dividend then declared, and which had been running ever since at a charge of 5 per cent. Turning to the accounts, it would be noticed that the item of sundry creditors was about £900 more; but, on the other hand, stocks had increased by something like £1000—the extra amount being for coal and pipes. There had been an expenditure for plant during the past half year, amounting to £400, chiefly caused by an extension of mains, as the Municipality required an additional 1¼ miles of street lighting. The increased price of gas had resulted in a gain of about £500. During the half year, the Directors had had to renew about one-third of their debentures at the same rate as before—viz., 6 per cent. This was disappointing, as he considered they ought to have obtained them at ½ or 1 per cent. less; but, as this could not be done, they had to submit. Before the next debentures became due, he trusted they would be a dividend-paying Company, and able to issue them at not more than 5 per cent. The shareholders would have noticed from the report that their Manager had resigned. Mr. Smith said he much regretted having to do this, as Singapore suited him; but the change was entirely owing to the health of his wife. The Directors were making arrangements for another Manager, and hoped to secure his services at the end of January, so that he could reach Singapore early in March, and enable Mr. Smith to return at the end of that month.

Mr. W. T. BATTEN, in seconding the motion, said his feelings that day were those of great disappointment. Six months ago, when he and the other Directors stood before the shareholders, they, with the exception of Mr. Green, believed they were out of their troubles, and almost promised that, at this meeting, they would be able to declare a dividend. They undoubtedly would have been in a position to do so if they had not had an abnormally bad half year. Exchange had been worse than ever; coal had cost more; and, instead of doing as well as they expected, they had had, owing to their stokers leaving, an unsatisfactory make of gas per ton of coal. Consequently, the Directors were compelled to advise the shareholders to forego the 2½ per cent. dividend which they had intended to pay. When the balance-sheet was made up, it was decided to pay this dividend, because the Directors felt that the shareholders had been long-suffering. But their Auditors (Messrs. Magnus Ohren and T. Guyatt) sent the Directors a semi-official letter to this effect: "We beg to remind you that, whatever dividend you may pay, you are depriving yourselves of the amount of working capital which is absolutely necessary for carrying on the business of the Company. We may also remind you that, in our opinion, the two sums due to creditors for borrowed money—David King £930 and Henry Smith £686—on which the Company is paying interest, should be paid off before a dividend is recommended to the shareholders." If the shareholders would leave the balance in the hands of the Directors, it would greatly help them. They had done their best for the shareholders; and they were sorry they had not been more successful.

Mr. H. J. ROBUS, while fully acknowledging that the Directors had had to contend with some uphill work in carrying on the concern, said that, after the Chairman and Mr. Batten had, at the last meeting, practically promised a dividend on this occasion, he was much disappointed with the results. He criticized certain items in the accounts, and suggested that perhaps it would be wise to alter the form of the profit and loss account, so as to give the details in a more explicit manner. He really could not understand where the extra £1100 had gone in coal; and he gave notice that, at the next meeting, he should move that an Investigation Committee be appointed to confer with the Directors as to the future working of the Company.

Mr. DYER was also disappointed. He fully expected that, with the increase in the price of gas, they would have come out with at least £500 profit. He saw that coal had cost them £1079 more, from which additional expenditure they had only realized £533. There must surely be something wrong somewhere; and it would be interesting to know how much gas their Manager had been getting from the coal. His own conviction was that the works had been allowed to run down.

Mr. B. GREEN stated that the make of gas had been 8197 cubic feet per ton of coal carbonized; and the sale, 7887 cubic feet. This, of course, was a very low make; but they could not get the Chinese and Malay stokers to work like Englishmen. He thought that there was a prospect of the Company now earning a profit, and that next half year the Directors would be in a position to recommend a dividend.

Mr. ROBBINS, calling attention to a sum of £423 that had been added for extensions during the half year, expressed the opinion that, in the present position of the Company, it was most unwise to go on spending money on the works and plant. Commenting on the accounts, he pointed out that the gas and meter rental was placed at £9170. But on the other side they had to set against that £543 for prompt payment and allowances; bad debts about £3; and loss on exchange, £3871. Therefore the gas and meter rental was really only £4753, of which sum they paid away £1496 for salaries and collectors' commission, which was over 30 per cent. He urged that the new Manager should go out with express instructions that some alteration should be made in this respect.

Mr. F. CRISP observed that in 1893 they had an amount for sundry creditors of £5219; while now the item stood at £2868, £1000 of which was accounted for by the increase in the stock of coal, &c. He thought the present Directors had, in the past three years, brought the concern from a state of bankruptcy into a sounder position. The balance-sheet was a better one than they had had since he had been a shareholder.

Mr. S. SIMMELKJÖR remarked that the form in which the accounts were presented was misleading. For instance, the gas and meter rental was put at £9170, which was equal to £3 18s. 11d. per ton of coal carbonized. He did not know of any Company who received so much. But was it true that they had obtained this large amount? Their gas-rental was paid in the currency of the country; and therefore they had received about $42,000. This had been put down in the accounts at £9170. What they had actually received was $42,000 at the rate of 2s. 3d., which represented something like £5000, which, in his opinion, ought to have been the amount entered in the accounts. For coal, they had only spent £4000; while for the bye-products they had taken credit for £3521, so that, from this source alone, they had got back about 90 per cent. of the cost of coal. He dealt with other items in the profit and loss account in a similar manner; and, before concluding, he expressed the opinion that there was every prospect of the Company doing a good business.

Mr. BATTEN, replying to Mr. Robus, stated that the extra cost of £1100 for coal was due to it having to be bought abroad. As to Mr. Simmelkjör's remarks, the accounts were undoubtedly inflated; and, if they could only carry out the suggestions Mr. Simmelkjör had made, it might be to the benefit of the Company. But there were difficulties in the way—difficulties of management and book-keeping, which he could not then go into. They brought dollars over at 4s. 6d., but they would, by way of experiment, make a change to 4s.; and, if this worked advantageously, they would make a further change. In answer to Mr. Robbins, he pointed out that they were compelled to spend money when called upon by the Municipality for extensions.

The motion was then carried.

Resolutions were also passed thanking the Chairman and Directors, the Auditors, and the officials, for their services.

Mr. MAGNUS OHREN, in replying for the Auditors, stated that there were in the accounts many items that they would like to see altered; but the great blot on the accounts, so far as he could see, was bad working. The coal had not produced sufficient gas; if it had, they would have made a profit. He hoped the new Manager would devote a great deal of his attention to the retort-house, because there a dividend could be produced.

This concluded the proceedings, which had been of unusual length.

THE DUBLIN CORPORATION AND THE GAS COMPANY.

The Gas-Testing Arrangements.

In our "Parliamentary Intelligence" to-day, we allude to the intended application of the Dublin Corporation for parliamentary powers in regard to the testing of the gas supplied by the Alliance Company. The following are the proposals of the Corporation as contained in the notice given for the Bill: Provision is to be made for the appointment by the Corporation of gas examiners, whose duties are to be prescribed; and also for ensuring that the quality, purity, and pressure of the gas supplied by the Company is equal to the standard. The standard price of gas is to be revised. The situation and number of the testing-places, and the apparatus for testing the illuminating power, purity, and pressure of the gas within the city, are to be determined; and the provisions of the Company's Act of 1883, having reference to the price of gas, are to be altered and amended. The accounts of the Company are to be audited; and, so far as may be necessary, the above-named Act, as well as any other relating to the Company, is to be varied or repealed. Provision will be made for the appointment by the Board of Trade of persons to act as Gas Referees, who are to prescribe and certify the number and situation of any additional testing-places, and the apparatus and materials and arrangements therein. The Company are to give the Referees all reasonable access to their works, and afford them all such facilities as may be necessary for the proper discharge of their duties. It is proposed that the Board of Trade shall, on the application of the Corporation, determine as to the efficiency of all apparatus, materials, and arrangements supplied by, or in charge of, the Company for testing the illuminating power and purity of the gas; and on such application they are to settle and determine any matter on which a dispute or difference may have arisen between the Company and the Corporation. The Company are to give notice to the Corporation before they shall be entitled to examine, test, or inspect the meters, governors, or other plant belonging to the Corporation. In the event of the Company failing to comply with any of the obligations imposed upon them by the intended Act, or with any regulation or requirement prescribed or certified by the Gas Referees, they are to be liable to such penalties as may be prescribed in the Act and the Public Act; and provision is to be made for the recovery of these penalties.

The Affairs of the Para Gas Company.—In a letter which appeared in the JOURNAL for the 12th ult. from Mr. S. Joshua Cooper, attention was directed to a meeting of the shareholders of the Pará Gas Company which had been convened for the purpose of considering a proposal of the Directors to reconstruct the Company, giving the preference shareholders priority of repayment of capital in case of winding up—an advantage they have not hitherto possessed. As it is customary for the proceedings at the meetings of this Company to be reported in the JOURNAL, and readers may be expecting a report on this occasion, it may be mentioned that a representative attended as usual, but was not allowed to remain. He was informed that the Directors considered it advisable that the proceedings should be private, as, in the course of the discussion, reference might be made to matters, which, in the interests of the Company, it would be well not to publish.

WORKMEN AS DIRECTORS.

Mr. Livesey Interviewed.

[From the *Globe*, Friday, Nov. 29.]

Public announcement has just been made of the fact that, in the coming parliamentary session, the South Metropolitan Gas Company will seek for power to permit their workpeople, in virtue of their interest in the undertaking, to enjoy the privilege of representation on the Board of Directors. This proposal, first heard of some months since, is of so novel a character, and, in its ultimate effect upon the relations between capital and labour, may so seriously influence the existing economic conditions, that the result of an interview with Mr. George Livesey, the Chairman of the Company, and parent of the scheme, cannot fail to be of interest. The exact details of a somewhat Utopian idea have not yet been settled; but Mr. Livesey, in answer to questions by a representative of the *Globe*, indicated pretty fully the nature of this unlooked-for development of the profit-sharing scheme instituted at the time of the now historic strike, and a development, it should be added, in regard to the wisdom of which opinions on the Board are sharply divided. The men having now agreed that half their share of profits shall be invested in the Company's stock, Mr. Livesey contends that the further development must sooner or later be a demand for some voice in the management of their own property. So far no such demand has been made; the Chairman prefers to anticipate it.

They have already invested £26,500, said Mr. Livesey; and I anticipate that in three years it will have reached £50,000, the sum which I suggest should carry with it the right of representation. The employees have made no suggestion whatever that they should have any voice in the management; and when the profit-sharing was started, it was clearly stated that it would not carry with it any part in the control of affairs.

Why, then, did I take the initiative? Well, the idea was first suggested to me when I was a member of the Labour Commission; and, having closely watched labour questions, I have noted that the drift of opinion of the best of the labour leaders has been in favour of works being conducted on co-operative lines. I know it is objected that my scheme is premature; and it is also contended that the proportion of the employees' holding is so small, compared with the total capital (excluding debentures) of £2,250,000—which is worth more than double, and represents £5,000,000 at least—that it could give no right to a share in the management for a very long time.

How many is it proposed that the £50,000 should place on the Board? was asked.—That we have not determined, answered Mr. Livesey. Some say they would rather have two than one on the Board, and I rather incline to that opinion. Both the employees and officers ought to be represented; and the difficulty is that the officers do not wish to be represented. My idea is that, in course of time, we should have two or three employees on the Board.

Have you considered that this would tend to minimize the power of what one must term the real shareholder Directors?—Well, it would be a case of three to seven, was the reply; and if the seven could not hold their own in all that was right and proper, they ought not to be Directors.

Might it not happen that this development of the bonus system, in itself an act of grace, would lead to further demands from within, as well as from the men themselves?—Oh, said Mr. Livesey, we have dropped that term. The annual bonus was in the first instance an act of grace; but I am satisfied now the employees earn the bonus by the increased interest they take in the business. As to the other point, that is what my friends are afraid of; but I think it would be much the reverse. The more open you are, the more you will win their confidence. My idea is that the Workman Director would find most difficulty with the class of men who would think he was on the Board to look after their especial interests. It is so hard to make some understand that the interests of employer and employed are identical.

Do you not contemplate that no little trouble would arise from the dual duties and position of such Directors?—Yes; that is one of the objections. They say you will be expecting a man to be a workman five days in the week and a director the remaining day; but I believe the men have sufficient sense to understand the position. The fact that the workmen themselves would create the authority of their foremen, for instance, would make them more ready to respect that authority than when imposed arbitrarily.

Is not this double *rôle* expecting from a man a rather heroic attitude?—I know that will be said; but that is my opinion from all I have been able to gather. There is somewhat of an analogy already. One of the workmen in the Leith Gas-Works has been elected on the Corporation; and it is quite within the range of possibility that he will be elected on the Gas Committee, as the Corporation manage the lighting.

So he may at night give orders to the Engineer who in the day would be his master. Is not that rather Gilbertian?—It may be so, said the Chairman. I admit it is an experiment; but the scheme is to be terminable in three years, and is to receive the approval of the Board of Trade before it is put in force. If it does not succeed, of course, it can be dropped.

But once given the power, the men would hardly relinquish it?—I should put it to them, and say, "It is an avowed experiment. If you select men who will enter into the spirit of the thing, it will continue; but if you choose those of the agitating class, and difficulties arise, it will be your fault if it is dropped." It is said they would strike if it dropped. I do not believe it. They would acquiesce—they are neither Socialists nor the fools Trade Unions would have us believe.

A man direct from the gas-retort cannot, it was suggested, possess such commercial knowledge as one looks for in a Director of such an undertaking as the South Metropolitan Gas Company.—The workmen are rising rapidly into power, was the reply. I want to educate them to use that power wisely. We require that a man elected by his fellows must have been seven years in regular service with the Company, and have invested not less than £100. I admit, said Mr. Livesey, in answer to another question, that a Director's qualification is very

different—£2000 of stock, worth £6000. Of course, I say, let the workman's fee be proportionate—from 10s. to £1; and not more than an ordinary day's pay.

Does not this suggest great disparity? Accumulations of profit-sharing, a boon granted by the shareholders, will rank with capital purchased at high prices in the open market?—When their money is so applied, the men have as much right as anyone else to a voice in the control of their funds. On the principle of the widow's mite, his £50 of total savings will be more to him than the £5000 of the man of wealth. Relatively, his interest in the concern will, therefore, be greater than that of the larger shareholder.

Questioned as to whether he did not anticipate that the Workman Director might be more open to temptation in business dealings, Mr. Livesey said he had no such fear. He added that by the time the £50,000 was reached there would be 2500 employees owning stock. "I say," concluded the Chairman, "that in the course of time the policy we have pursued (and the Board was perfectly unanimous, and enthusiastically so, in making our people shareholders) would lead to the men asking for representation. I merely anticipate that demand."

Some examples of the application of the workman-director proposal were furnished by Mr. Aneurin Williams in the following letter in last Saturday's *Globe*: "I think it will interest your readers to know that I am every week presiding at the Board of Management of a small limited liability business in London, where three out of the nine Directors are ordinary working men employed in the business, and elected by their fellow-workmen to represent them. This is the arrangement which you call Gilbertian; and yet, though it no more works perfectly than any other human institution, it certainly works well. The business is, as I have said, a small one, employing some fifty hands, who are practically all shareholders; but the capital held by outsiders is three or four times the amount of that held by employees. There are, in fact, some dozens of flourishing businesses in the United Kingdom—registered under the Industrial and Provident Societies Acts—which have one or more employee directors; I mean ordinary journeymen. I could name to you one doing a trade of £40,000 a year, and employing 300 hands, where the Board of Management has consisted of employees almost exclusively from the foundation of the business eight years ago, and where the shareholders have received an average of about 7 per cent. Here, too, the capital of outsiders largely preponderates. I could refer you to larger businesses, though the figures would still be small compared to those of the South Metropolitan Gas Company. But when the thing has been proved to work well over and over again on a substantial commercial scale, does the increase of size make so much difference? You rightly say that the workman is apt to be deficient in commercial knowledge. My experience shows me how true that is. But he is usually quick to learn—at least to learn that he is ignorant; and meanwhile he is rich in knowledge of details of the business, and (not least valuable) of the feelings and opinions of the employees."

ELECTRIC LIGHTING NOTES.

Is the electric lighting undertaking of the Worcester Corporation a success or not? was the question discussed at the meeting of the City Council on the 20th ult. A small sum which it was recommended should be spent at the Powick generating station stirred Mr. Rushton to inquire how much more money was going to be spent on these works. The Council, he asserted, scarcely knew where they were; and as to income—they knew nothing of it. He moved an instruction to the Electricity Committee to supply the Council with a statement of all costs and expenditure incurred from the commencement of the works up to the present, and of the income from all sources; also the amount of all works entered into by the Committee, but not yet carried out. This found a seconder in Mr. Blackford, whose opinion was that the electric light was a very great mystery. This time last year, when the station was opened, it was, he said, held out to the Council that the electric light would take the place of gas; and they would save some £3000 otherwise paid to the Gas Company. Now he understood that they were about to contract with the Company for street lighting by incandescent gas-lamps; and no one knew what that would cost. The electric lighting had not been carried out to the satisfaction of the ratepayers or the Council in the manner which it ought to have been done. Alderman Day admitted that more money had been spent than was contemplated; while Mr. Yeates observed that he was led to understand from Mr. Preece's statement that there was sufficient power at the station to light the whole of the city. There was no street lighted by electricity from the top of Foregate Street up to the water-works. They were spending between £70,000 and £80,000; but why did not the Electricity Committee go on lighting the streets, and so give the citizens some confidence in the scheme? All that they had at present was the electric lighting of Foregate Street, High Street, Mealcheapen Street, and Broad Street. Mr. Chaplin denied that the Committee had spent £70,000, and stated that the correct figure was only £51,500. The discussion was carried on in the same vein by one or two other members; and then the Chairman (Mr. G. H. Williamson) responded. He did not think it reasonable that, within twelve months of starting a large undertaking like the electricity works, the Council should expect the Committee to say it would be a financial success. With regard to street lighting, the Committee found the incandescent electric lamps for this purpose would not pay. If the Council wanted additional arc lighting as in the High Street, they should state how far they would extend it. But the Committee were not prepared to say that they could light a large number of streets with incandescent lamps at the same price as with gas. If the Watch Committee wished to light streets with incandescent lamps, that was their business. In conclusion, Mr. Williamson pressed his colleagues to take a more hopeful view, and appealed to those who had the mains already laid near their doors to adopt the electric light. The amendment was lost by 27 votes to 9; and the original motion was carried.

The Electricity Department of the St. Pancras Vestry require more money. Thus the Committee, at last Wednesday's meeting of the Vestry, reported as follows: "On the presentation to the Vestry in April last of the annual accounts of the electricity undertaking, in the report accompanying the accounts, it was shown that a further loan of £10,000 was required to adjust the capital account. The application for the loan at that time was deferred, pending the negotiations with the London County Council on the question of the period for which loans for initial purposes for electric lighting undertakings should be granted. The period of 42 years for these purposes having since been conceded by the Council, your Committee recommend—'That application be made to the London County Council for a loan of £10,000, repayable in 42 years by equal half-yearly instalments of principal and interest combined.'" This simple little financial transaction was agreed to without discussion. Later in the evening, the incandescent system of gas lighting came in for notice; the Committee reporting that, as instructed by the Vestry on the 25th of September, they had further considered the letter from the Lighting Corporation, Limited, respecting the lighting of the public streets by their system, and had caused inquiries to be made about it. They reported as follows: "The Lighting Corporation system is an improved Wenham gas-lamp, and not the Welsbach incandescent gas-light. No public street lighting by the Corporation's lamps is yet in operation in London; and until a specimen of the light in the streets is seen by the Committee, they recommend that no action be taken." To this the Vestry assented. Then came the consideration of the demand of a firm for compensation in consequence of damage done to their premises by the disturbance of the footways during the building of a manhole; and the Committee recommended that a sum of £15 should be paid in full discharge of all claims—a small matter in itself, but a valuable precedent.

The Bromley Urban District Council have resolved to hand over to a private company their Provisional Order empowering them to supply electric light and energy, subject to the approval of the Board of Trade, and on payment of £777, the cost of obtaining the Order. The Council have come to this decision because they do not think it would pay to put the electric light into competition with the local gas supply; and as the Board have within their reach all the figures necessary to come to a safe solution, it is not likely that they would have relinquished the Order if there had been any likelihood of the electric light being profitable.

Last Thursday, the Vestry of Hampstead presented an edifying and altogether unintentional illustration of the risk of self-exposure that attends the proverbial pugnacious dweller in glass houses. The vestrymen waxed exceeding wroth over the alleged "bad quality and quantity" of the gas supplied by The Gaslight and Coke Company to the public lamps in the parish, and decided to approach the London County Council on the subject. It would therefore be inferred that the electrical illuminant supplied to the ratepayers by the indignant Vestry is of the most satisfactory character, and that its quality and quantity are above reproach. But what are the facts? At the same meeting of the Vestry, a member asked Mr. Cottam, the Chief Electrical Engineer, whether he had made provision for preventing "such a collapse of the electric light as occurred the previous night." No suggestion of complaint to a higher authority was made; but Mr. Cottam's reply, to the effect that such provision had been made, but that the unfortunate occurrence referred to resulted from dilatoriness of a contractor, was received with but little comment—Mr. Watts only expressing surprise that any contract should be agreed to by the Vestry without its containing a clause whereby the contractor is fined for not fulfilling his undertaking within the specified limit. For some time past, the Lighting Committee have been considering the advisability of lighting the High Street and approaches with either electric arc lamps or incandescent gas-lamps; and they reported that they did not think it desirable at present to introduce either system. Mr. Thwaites, the Chairman of the Electricity Committee, followed up this statement by adding that incandescent gas lighting for street-lamps was only in its experimental stage; while the Vestry, being suppliers of electric current themselves, would not be justified in experimenting with the incandescent gas light. A sum of more than £2000 was voted for laying down the necessary mains and transformers for the further extension of the electric light to private residences.

Last week, the City of London Electric Lighting Company, Limited, invited subscriptions for an issue of £100,000 of 5 per cent. debenture stock at the price of £128 per cent.; being the balance of an authorized issue of £400,000, redeemable by the Company at £125 per cent. This opportunity was taken for furnishing some particulars as to the position and progress of the Company. Their expenditure amounted on June 30 to £1,078,684; the assets on the same date being £130,932. On October 30, 1892, the number of customers supplied was 200, or equal to 18,100 8-candle power lamps connected; on Oct. 30 last, the number was 3820, or equal to 180,000 lamps of that power. The gross income for the period ending Dec. 31, 1892, was £12,449; for last year it was £68,864; while for the nine months ending Sept. 30 it was £60,389, as compared with £38,761 for the corresponding period of 1894.

The Town Clerk reported to the Finance Committee of the Cardiff Corporation last Wednesday that the Local Government Board had given their consent to the Corporation borrowing £12,885 for electric lighting purposes, to be repaid with interest within 25 years.

Mr. G. W. Willcocks held an inquiry at Huddersfield last Thursday into an application made by the Corporation to the Local Government Board for sanction to borrow £50,000 for the purpose of extending the electric lighting works and plant. It was stated by the Town Clerk (Mr. F. C. Lloyd) that the Council had already obtained power to borrow £50,000 for the erection of the present works, and the supply of energy for a fixed area. There were now 256 consumers, and 36 applicants waiting for supply. The present borrowing powers were exhausted to within £3000, and that was required for work in hand. The Corporation had had a large demand from districts in the borough outside the compulsory area of supply; and the Engineer was of opinion that provision should be made for a total supply of 50,000-candle power. Alderman Calvert, the Chairman of the Electric Lighting Committee, said that last year the present undertaking had a balance of £1376 over working expenses; but this was not sufficient to pay the interest and annual instalment of the first loan, owing to the

short period for which the loan was granted. The Town Clerk announced that he had been to the Board of Trade, who told him that, when they fixed the time for the repayment of the capital at 15 years, it was pretty much an experiment, and that the application for an extension of time was unanswerable, and would be granted. In reply to the Inspector, he said they would have to be content with an extension to 25 years for the present, and then make an application later on for the period to be prolonged.

THE WATER-WORKS PURCHASE QUESTION AT PORTSMOUTH.

A Special Water Committee of the Portsmouth Town Council to whom had been referred the consideration of the question as to terms being arranged for the purchase of the Water Company's property, presented a report at the last meeting of the Corporation. In this they submitted copies of documents dealing with the matter, and asked for instructions. The documents included the report of the Committee to the Council in 1893; and a letter, dated Oct. 22, from Mr. R. W. Ford, the Secretary to the Water Company, saying that, if the Council wished to revive and continue the negotiations for the purchase of the water-works, which had been broken off, the Directors would be happy to consider any proposals. They could not be reasonably expected, however, to offer the undertaking on lower terms than formerly, and especially as the Company's capital, expenditure, and income had since substantially increased. The Chairman (Alderman Scott-Foster) said the Committee wanted to know if the Council meant business; for it was quite useless for the members of the Committee to interview the Directors over and over again if in the end nothing was to be done in the way of purchase. He believed that, if they could obtain a hundred years in which to repay the principal, they could purchase with safety, and show a profit on the first year's working of between £500 and £1000. He moved that the Committee be instructed to go on with the negotiations. Mr. Ashdowne seconded the motion, which was supported by Sir W. Pink. Mr. Evans considered the price too high. If, he said, they purchased on such terms, they would for the next ten years be losing £2000 a year, for the Council could not hope to manage the water-works as well as the Directors were doing. Alderman Scott-Foster, in reply, said that they would not purchase at all, unless they could get 80 years for repayment, with the suspension of the sinking fund for five years, or unless they could get 100 years for the repayment. They would not think of proceeding if it was found there would be a deficiency. The time for purchasing the works was now or never. If they let other places go to the Company, and get supplied, they would never be able to purchase. The resolution was carried by a large majority.

LAMBETH WATER-WORKS COMPANY.

The Directors' Report.

At the Half-Yearly General Meeting of this Company last Tuesday, the Directors reported that, in the six months ending September 30, there had been an expenditure of £9110 on capital account; making a total outlay of £893,072 on new works, &c., since the passing of the Metropolis Water Act, 1871. During the half year, 1732 houses and other supplies of water, estimated to yield an annual rental of £3685, were connected with the works, as compared with 1357 houses, producing a rental of £3458, in the corresponding six months of 1894. With regard to revenue, there was an increase of £3024 in waterrents; but, on the other hand, there was an augmentation in the expenditure to the extent of £15,046. This principally occurred under the following heads: Distribution, mostly due to repairing and lowering mains fractured during the frost of last winter, £9930; pumping and engine charges, due to the alteration of engines at Ditton, and to the extra cost of pumping in consequence of leakages from consumers' lead pipes after the frost and during the subsequent drought, £5366; Thames Conservancy (the increased payment under the Act of 1894), £340; rates and taxes, £455; and law and parliamentary, £707. There was a reduction of £577 under the head of storage, and of £1571 for filtration, in both cases owing to comparison with a period when special renewal works were in progress. The surplus transferred from the revenue account to the dividend and interest account was £60,299. There was to the credit of the latter account, after payment of interest on debenture stock, an available balance of £53,450, out of which the Directors recommended the distribution of a dividend at the rate of £7 5s. per cent. per annum on all the share capital of the Company. This dividend amounted to £52,562; and a balance of £888 remained to be carried forward, in addition to £1750 standing to the credit of the contingency fund. The declaration of the dividend would entail a payment of £1040 to the Chamberlain of London under the sinking-fund clause of the Company's Act of 1886. The Directors expressed regret that the extraordinary and unavoidable expense incurred in repairing damage caused by the frost of last winter necessitated a further reduction in the dividend. The frost entailed a cost of no less than £27,882 on the Company. Of this sum, £13,427 was charged in the accounts for the half year ended March 31; £7228 was included in the accounts for the six months to the 30th of September; and the remainder is to be carried forward. Apart from contingencies, equally unforeseen as the phenomenal frost of last winter, the Directors regard the intrinsic value of the undertaking as unimpaired. The Engineer reported that all the works and plant of the Company were in good and efficient working condition. A constant supply of water was laid on to 1119 houses in the period under review; and it is now given to 64,856 out of a total of 102,285 houses—being 63 per cent. of the entire number, or 83 per cent. of the houses, &c., supplied by the Company in the Administrative County of London. The area under constant supply is still being extended. With regard to the troubles entailed by the frost of last winter, and the subsequent inquiry by the Official Water Examiner (Major-General A. de Courcy Scott, R.E.), the Directors reported that the inquiry had not concluded; the Company having still to state their case. The report closed with a reference to the proceedings of the Select Committee of the House of Commons on the Company's Bill of last session, which, it may be remembered, came to an abrupt termination on the dissolution of Parliament; and also to the inquiry recently held by Colonel Ducat, R.E., in regard to the capacity of closet-flushing cisterns, no report on which has yet been received.

BIRMINGHAM CORPORATION WATER BILL.

A Special Meeting of the Birmingham City Council was held last Tuesday—the MAYOR (Mr. J. Smith) presiding—to receive the report of the Water Committee upon their proposed application to Parliament during the coming session (*ante*, p. 1099).

Alderman LAWLEY PARKER first moved that the draft of a Bill for empowering the Corporation to acquire sites for the deposit of spoil from the aqueduct works authorized under the Corporation Water Act of 1892, to construct a line of railway from Rubery Station to the site of the authorized reservoir at Frankley, and for other purposes, be approved, and that a public meeting be held to receive the authority of the ratepayers to the Bill being proceeded with. He said the estimated cost of the work proposed to be carried out was £110,000. As a matter of fact, however, there was no increase in the capital outlay; but, on the contrary, the Committee believed there would be a saving in the expenditure. In the first place, they required land for the purposes of deposit of spoil; and this was included in the general sum for the land for the purposes of the undertaking in the Act of 1892. The new Bill also provided for two short deviations of the aqueduct—deviations which were in the direction of economy; and the cost of the land and the aqueduct in the 1892 Act would more than cover their cost. The railway for conveying the material needed at the Frankley reservoir and works would also be in the interest of economy; and that portion of the undertaking was really the only new work. He thought that the outlay for the railway might be estimated at from £7000 to £12,000, according to the requirements of the Board of Trade; but the sum would be saved by the reduction of the cost of haulage of material to the works.

Alderman POLLACK seconded the motion, which was unanimously carried.

Alderman LAWLEY PARKER, in moving the adoption of the report, said that, since the Council approved the principle of the Bill, there had been a marked difference in the attitude of the landowners; and he was glad to say that not a few spoil-banks had been acquired on far more reasonable terms than contemplated by the landowners themselves. The Committee had been able to arrange terms with Lord Cobham for the acquisition of land for the railway and the quarry and spoil sites; and he did not think it was likely the Bill would be opposed by his Lordship. The Committee did not contemplate doing any portion of the work themselves. There seemed to be some confusion in the minds of certain members as to the policy adopted by the Committee in carrying out the whole of the great water scheme. In May, 1893, the Committee reported that they had decided that the dams at Caban Coch should be constructed by the Corporation, and that the works for the railway and aqueduct would be contracted for. This was approved by the Council; and in February, 1894, the Council also approved the decision of the Committee to do the work in the valley near the dam themselves, on the ground of safety. The comparative cost of the work was about one-fourth of the whole; the other three-fourths would be contracted for in the usual way.

Alderman COOK seconded the motion, which, after a number of questions had been answered, was unanimously agreed to.

THE NIDD WATER-WORKS OF THE BRADFORD CORPORATION.

The construction of the new water-works of the Bradford Corporation is now proceeding apace. With the exception of the service reservoir and filter-beds at Chellow Heights, and the Angram, Lodge, and High Woodale reservoirs near the source of the Nidd, all the various portions of the works are in hand; and on the supply works proper, extending from High Woodale, near Little Whernside, right away south to Chellow Heights, a distance of nearly forty miles, 2000 workmen are busy constructing tunnels, aqueducts, cut-and-cover work, and bridges at numerous points along the route. At the same time, the construction of the great Gouthwaite compensation reservoir, two miles beyond Pateley Bridge, is being steadily carried out, and the roads interfered with are being rapidly deviated. The reservoirs at the head waters of the Nidd above Woodale will probably not be begun for some years; but, in the meantime, an embankment is being made across the Nidd at this point, and a small impounding reservoir constructed, from which a partial supply of Nidd water will be obtained. The Gouthwaite reservoir is one of the most important parts of the whole undertaking. Across the Nidd Valley, about two miles above Pateley Bridge, a massive embankment is being built, which intercepts the Nidd, and will convert the valley above the embankment into what might well be called a small lake, two miles long and half a mile broad. The embankment will be 750 feet long and 110 feet in depth; and already it has been constructed for a length of 320 feet, and to a depth of 50 feet. This immense dam is composed of masonry; and in its composition and formation is almost novel in this country—the only one similar to it being that in connection with the Liverpool works at Lake Vyrnwy. The above particulars are extracted from an article in the *Bradford Observer*, which closes by remarking upon the vast amount of supervision which an undertaking of this kind involves, and the heavy responsibility that will rest for some years on the Corporation Water Engineer (Mr. James Watson).

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

The situation of Engineer and Manager of the Perth Corporation Gas-Works, vacant by the retirement of Mr. Thomas Whimster, has been filled up by the appointment of Mr. Andrew Wilson, Assistant Manager of the Carlisle Corporation Gas-Works. Mr. Wilson is the son of Mr. Thomas Wilson, the highly-esteemed Manager of the Coatbridge Gas Company. I stated last week that the original list of 43 applicants had been cut down to nine. On Monday night, the Gas Commission met in private, and reduced the nine to a list of three—Mr. Wilson; Mr. W. S. M'Gregor, of Leslie; and Mr. G. W. Anderson, of Whyteleafe, Surrey. These were voted upon, with the following result: Wilson, 15; M'Gregor, 7; and Anderson, 3. Mr. Wilson thus had a majority of votes over the other two, and was at once adopted. A public meeting of the Commissioners was held on Thursday, when the recommendation that Mr. Wilson be appointed was submitted in a resolution which also contained the provisions that the salary was to be £300, that the appointment was to be during the pleasure of the Commission, and that the new Manager was to commence his duties on an early date. Lord Provost Dewar moved the adoption of the recommendation. He said he thought the Commission had made a very wise selection. They had got a young man—perhaps some might say too young—but he did not think his youth was any objection. Personally, he thought it a recommendation. He was not an untried man; he had all the experience of a gas engineer. His father was a well-known gas engineer; and under his tuition he had attained already considerable distinction in the profession. Mr. Wilson began life by learning gas engineering; and he also studied chemistry under Dr. Tatlock. What, perhaps, recommended Mr. Wilson to him was that Mr. Hepworth, who was then Engineer of the Carlisle Gas-Works, selected him to be his assistant. That was a high recommendation; and during the two-and-a-half years he had given entire satisfaction to the Corporation there, and both to Mr. Hepworth and his successor, the present Engineer of the Carlisle Gas-Works. He had no doubt Mr. Wilson would become a well-known man in the gas world; and they might congratulate themselves and the community that they had secured his services. Bailie Cuthbert seconded the adoption of the recommendation, which was agreed to unanimously.

Mr. Wilson is 27 years of age. He was educated at Allan Glen's School, Glasgow, which is one of the new establishments in which the technical side of education is developed in preference to the classical. After leaving school, he spent seven years in equipping himself for the post of gas manager. These seven years he distributed as follows: Two years in the drawing office of the Barrowfield Iron-Works, Glasgow, learning the designing and construction of gas plant; one year in the fitting shop of Messrs. Lamberton and Co., engineers, of Coatbridge, learning the practical use of tools and the construction of engines and engineering plant generally; two years in the laboratory of Mr. Tatlock, City Analyst of Glasgow, studying the chemistry of gas and its bye-products; and, finally, two years under his father at the Coatbridge Gas-Works, where he went through every branch of gas manufacture and engineering, from the retort to the consumer's burner, and where he held the post of Superintendent of the Mains and Service Department. During these two last years, he designed for his father plant to the value of over £30,000, as well as superintending its erection at Coatbridge and other places for which his father is consulting engineer. Two-and-a-half years ago he went to Carlisle, where he has had entire charge of the manufacture and distribution of gas, as well as the working of plant for the recovery of residuals. He holds first-class certificates in chemistry, machine construction, and electric lighting, from the Science and Art Department, and a first-class honours certificate for examination in gas manufacture, from the City and Guilds of London Institute.

Mr. Wilson is to be congratulated upon his early advancement to one of the leading appointments connected with the gas industry in Scotland. This selection emphasizes a feature which has developed in recent years, not only in the gas industry, but in other branches—the certainty with which young men who are specially trained for a particular calling are coming to the front. We have, among the gas managers of some years' standing, men in whom the working side was the predominating and the intellectual side was the accessory, albeit the accessory which raised them above the companions with whom they started life. It is a sort of melancholy feeling that there would appear to be no prizes for such men now. They may succeed in getting into small works; but there they must remain, no matter how good their results may be. The successful applicant now must be mentally equipped, more than practically. He must have the hall-mark of some teaching institution; and if he possesses that, no matter though his experience may be limited, his professional pathway is easy. I can recall no instance in recent years in which a gas manager of long experience has obtained a situation in Scotland; but I have several in my mind in which the appointments have gone to young men with a scholastic training. I make no comment on the practice, whether I consider it good or bad. I merely wish to point out that if anyone desires to fill an important position in the gas industry, he must first arm himself with credentials as to capabilities in regard to other matters than the mere making and distributing of gas. There will be no promotion for him unless he does.

The Edinburgh and Leith Gas Commissioners held a meeting on Monday. The most interesting item of business they had before them had reference to the election of one of the workers in the Leith works as a Town Councillor in Leith. I was in expectation that Mr. Kelly's election might lead to some experience being had on a subject similar to that of the workman-director; but this has not been realized. In the first place, Mr. Kelly was not appointed by the Leith Town Council to represent them on the Gas Commission; and in the second place, Mr. Kelly has left the service of the Commissioners. A question was put by—somewhat strangely—a labour representative who is sent to the Commission by the Edinburgh Town Council, whether Mr. Kelly was not debarred by the self-denying ordinance from continuing in the employment of the Commissioners. The Clerk replied that he was debarred; but Mr. J. G. Holburn, M.P., who is a Leith representative, explained that Mr. Kelly left the service of the Commission immediately after his election to the Leith Council. No question such as I expected, therefore, can arise.

The figures of the Engineers as to the output of gas showed an increase on the month of 4,814,000 cubic feet; and since the 15th of May, of 23,096,000 cubic feet. Bailie Kinloch Anderson, referring to this, said it would be observed, from the report for the month, that the influence of the electric light was now being felt. In Edinburgh, there was an increase of under 700,000 cubic feet; whereas in Leith, where they had not the electric light, the increase was over 4,000,000 cubic feet, and was the proportionate increase they had had for some time. He had no doubt, however, that they would be able to hold their own.

One other item which was before the Commissioners must be mentioned. The extraordinary letter by Dr. Taylor, suggesting the removal of the Edinburgh Gas-Works to a site outside the city, had been considered by the Works Committee since the last meeting of the Commission; and the resolution of the Commissioners, on the recommendation of the Committee, was to take no action in the matter, but to thank Dr. Taylor for his communication.

It is reported from Earlston, a small town in Berwickshire, where there is a gas-works, that the owners offered to sell the works and plant to the community, but that the parties could not agree as to terms; the representatives of the community offering £600, and the vendors asking £1000. The negotiations thereupon, it is said, were broken off; and the townspeople received intimation that the supply of gas would be stopped, I think from to-night, whereupon it was resolved to advertise for offers for the erection of a new gas-works.

In Uddingston, a fine residential suburb of Glasgow, there has been some trouble on recent evenings, in the matter of the gas supply. On Sunday night, it was very weak; but on Tuesday night there was, it is said, an almost entire failure. The residents attribute the defect in the supply to the inefficient working of some new plant. That may be, but it should only be a temporary cause; and I have no doubt, considering the qualifications of the Manager, that when an explanation is given, it will be found to be quite a satisfactory one.

The Millport Police Commissioners have held their second statutory meeting, and unanimously resolved to adopt the Burghs Gas Supply Act. At present, the price of gas is 5s. 10d. per 1000 cubic feet; and the acquisition of the Gas Company's undertaking is looked upon as likely to lead in course of time to a reduction in price. The Largs Police Commissioners have also held their second meeting; but after discussion, they resolved to do nothing more in the matter in the meantime.

The Falkirk Gas Commissioners this week resolved, in consequence of the success of experiments with incandescent gas-burners in the public lighting of Glasgow, to fit these burners to a number of lamps in the town. At the same meeting, they decided to introduce prepayment meters.

In Kilsyth, where the gas supply is in the hands of the Police Commissioners, Mr. Shanks, the Convener of the Gas Committee, reported on Monday that he was in the gas-works the previous Saturday night; that at nine o'clock the whole of the retorts they have were in use; and that the large gasholder was entirely empty, and there was only one plate of the small holder to draw upon. They might tide over this winter as they were; but they would require to consider as to the providing of a new gasholder, and other extensions. The Committee would go into the matter and report to the Commission. This was agreed to.

The Finance Committee of the Arbroath Gas Corporation have given a well-deserved snub to the Harbour Trust bondholders, whose doings I referred to a fortnight ago. A firm of solicitors had written in the name of the bondholders, pointing out that the price of gas had been reduced from 5s. 10d. to 4s. 2d. per 1000 cubic feet, and that their security was thereby interfered with. A reply to the communication was directed to be sent, to the effect that the Corporation alone had the power to fix the price of gas, and that they had no concern with the Harbour subvention.

The rapid progress being made in the construction of the new aqueduct for conveying water from Loch Katrine to Glasgow is evidenced by the letting of the last contract—viz., the one at the loch itself. The conduit is 1 mile 27 chains long, and runs in a northerly direction from the north end of the Loch Chon work to Loch Katrine. The contract includes the driving of a tunnel 2347 yards long, in addition to the construction of a substantial masonry inlet basin, as well as the work entailed in raising the level of the existing basin. The Contractors are Messrs. Lawson and Son, whose offer was £40,450. The Engineer to the Water Trust is Mr. J. M. Gale, M.Inst.C.E., who has for many years ably filled this important post.

Storage Extensions at the Sowerby Bridge Gas-Works.—The Sowerby Bridge District Council have recently spent £900 in adding a lift to one of their gasholders; making its capacity 90,000 cubic feet, and bringing the total storage accommodation of the works to 490,000 cubic feet, which is about equal to a day's consumption at this time of the year. It is stated that it is intended to make further storage provision by erecting a new three-lift holder. Among other work which has been carried out has been the laying of new mains, at a cost of £2000. In respect of the gas-works loans, about £50,000 has been paid off; and there is now owing, in round figures, £27,000.

The Public Lighting of Kingston-on-Thames.—The Kingston-on-Thames Gas Company recently offered to undertake the lighting of the public lamps with incandescent burners, including the supply of mantles, at the same charge per lamp as formerly—£3 12s.—but with a first charge of 35s. per lamp for supplying and fitting the incandescent burners and lanterns. They suggested, however, that the present time was inopportune for any extensive alteration in this direction, as there would probably be a considerable reduction in the cost of incandescent burners when the patent disputes now pending were ended. There are 600 lamps in the borough; and the Town Council feel they would not be justified in incurring the expenditure which the change would involve. They have therefore resolved to continue the present system of lighting.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 30.

Sulphate of Ammonia.—The market has ruled quieter; and prices are tending rather in buyers' favour. In consequence of increasing supplies, dealers have been enabled to complete their requirements for the month without affecting values; and, there now being no pressing needs, business can only be done at a concession on prices lately paid. Of course, it is known that the bulk of the orders for December has already been absorbed by dealers; and as consumers are therefore not competing to any extent, values are somewhat irregular. It is difficult to estimate the future. On the one hand, makers still demand a premium of 7s. 6d. to 10s. per ton; while, on the other, speculative offers are being made abroad at very little above current values. Quotations are £8 13s. 9d. to £8 15s. east coast, and £8 16s. 3d. to £8 17s. 6d. f.o.b. Liverpool.

Nitrate of Soda.—It will have been noticed from the proceedings at the Companies' meetings this week that a combination appears as far off as ever; and any substantial improvement can hardly be expected for some time to come. Cargoes, November sailing, are worth about 7s. 7½d. Spot price is still 7s. 9d. per cwt.

LONDON, *Nov.* 30.

Tar Products.—Important sales of anthracene are reported; and the market for this article is undoubtedly better than it has been for a considerable time. Benzols continue strong; and values have materially advanced. The removal of the surplus production for enriching gas has had the effect of alarming colour manufacturers in respect to their future supply. Naphthalene salts are in request at improving rates. Carbolic acid is steady; and considerable shipments of it are being made. Pitch is weak, and looks as if it might see lower prices. The following rates have been paid during the week: Tar, 18s. 9d. to 24s. Pitch, 33s., west coast; 36s. 6d., east coast. Benzols, 90's, 2s. 1½d.; 50's, 1s. 10½d. Solvent naphtha, 1s. 3d. Toluol, 1s. 11d. Crude, 30 per cent., naphtha, 6d. Naphthalene, pressed, 50s.; drained, 30s. Cresylic acid, 1s. 1d.; crude, 9d. Carbolic acid, 60's, 1s. 8d.; 75's, 2s. 1½d. Anthracene, "A," 11½d.; "B," 10½d. All, excepting tar, less 2½ per cent. for cash.

Sulphate of Ammonia continues dull. The advance of the season does not, as was anticipated, bring higher prices. There is no parallel in the history of the trade, where prices have remained so low at this period of the year. Indeed, to-day's values are lower than sulphate has ever realized before. There is more inquiry for forward delivery; but makers invariably and naturally expect a considerable advance in price. Business has been done during the week for prompt delivery at £8 12s. 6d. to £8 15s., less 3½ per cent. at all ports, excepting London, which is quoted £9. Gas liquor is quoted at 7s. to 8s. per ton.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—During the past week, a very strong feeling has been aroused among coal traders here, with regard to the action of the railway companies on the increased siding-rents question. Notwithstanding the proposal made by the Coal Traders' Association, that any disputes between the merchants and the companies on this matter should be brought before the Board of Trade for settlement, the railway companies entered County Court actions against a number of traders in the district to recover these increased charges. Several of these actions have been dismissed by the County Court Judges as out of their jurisdiction; and others have since, I understand, been withdrawn by the railway companies. As the Coal Traders' Association had been put to great expense in preparing to meet these cases, the harassing policy pursued by the railway companies towards its customers has naturally caused a good deal of exasperation, especially as it had been hoped that the companies would have abstained from putting the coal traders to such unnecessary expenditure of time and money, in meeting a number of County Court actions, pending the decision of the Board of Trade with regard to the whole question. The business doing in most descriptions of fuel continues very moderate; and many of the pits are only working about four days per week, especially those raising the commoner qualities. House-fire coals have during the week been in perhaps rather better demand; but prices show no upward move. In the lower qualities of round coal suitable for iron-making, steam, and general manufacturing purposes, the supplies offering continue far in excess of the demand; and very low figures are being accepted. As regards engine classes of fuel, business continues limited, with prices cut extremely low; but a fairly active business is reported in the better qualities. At the pit mouth, house coals remain at about 10s. 6d. per ton for best Wigan Arley; 9s. to 9s. 6d., for seconds Arley and Pemberton four-feet; 7s. to 7s. 6d., for common house-fire qualities; 5s. 6d. to 6s., for ordinary steam and forge coal; and 6s. 6d., for some of the better sorts. Engine fuel ranges from as low as 3s. to 3s. 6d. per ton for inferior descriptions; with 4s. 6d. to 5s. quoted for the better qualities. No improvement whatever is noticeable as regards the shipping trade; business continuing very slow, with prices ruling extremely low. Ordinary steam coal does not average more than 7s. to 7s. 6d. per ton delivered at the High Level, Liverpool, or the Garston Docks.

Northern Coal Trade.—There has been increased dulness in the demand for steam coal in the North, and short time is now general at many of the Northumbrian collieries, though the price is still without much alteration. For best Northumbrian steam coal, the general quotation is still 8s. per ton f.o.b., though for one or two special markets 8s. 3d. is asked. Against this is to be set the fact that coal has in one or two cases been sold at slightly less than 8s. For second-class steam the general quotation is 7s. 6d. per ton f.o.b.; and for small steam the price varies from 3s. 9d. to 4s. The gas coal trade is now very active, the demand being at about its highest point; and the largeness of the deliveries on old contracts is so great that most of the output is taken up thereby, and there is very little for casual sale with some of the best of the gas coal collieries. For odd cargoes, when obtainable, from 6s. 6d. to 7s. 3d. per ton is the current price; but the bulk of the production is disposed of on contracts that are below these rates. In the manufacturing coal trade, there is very little alteration; the prices being practically unchanged this week. The large locomotive coal contracts are as yet unsettled in this district; but as the tenders are below the current year's prices, and as counter-offers are usually made, it is to be expected that the contracts when settled in a fortnight or so will certainly be at a reduction of some moment. As to the coke trade, there is considerable activity in the home markets, though for export there is the falling off that is general at this time of the year when Baltic shipments grow necessarily limited. More blast furnace coke is being sent to the North-west. The basis of price for shipment is 14s. 6d. to 15s. per ton f.o.b. In regard to gas coke, there are negotiations in progress for the quantities used by manufacturers for next year; but there are wide margins between the views of buyers and sellers as to the prices that are to rule. In the meantime, the exports of coke are fairly good, and help to keep down stocks, which would otherwise be large. For shipment, about 10s. per ton f.o.b. is the current quotation for gas coke.

Scotch Coal Trade.—There is no market change this week. There is a fair quantity of business doing; but the supply is more than equal to the demand, and prices are, if anything, lower than last week, though not quotably so. There is a general expectation of an improvement when the engineers' dispute is at an end, as there is a great deal of work on hand, and the demand will be greater than it is now. The prices quoted are: Main, 5s. 9d. to 6s. per ton f.o.b. Glasgow; ell, 6s. 9d. to 7s.; splint, 6s. 6d. to 6s. 9d.; and steam, 7s. 6d. to 7s. 9d. The shipments for the week amounted to 152,011 tons—an increase on the quantity in the preceding week of 5125 tons, and an increase as compared with the corresponding week of last year of 16,619 tons. For the year to date, the total shipments have been 6,743,930 tons—an increase over the corresponding period of last year of 2,070,498 tons, but a decrease on 1893 of 540,970 tons.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 1132.)

Issue.	Share	When ex-Dividend.	Dividend or Int. & Bonus.	NAME.	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.				£ s. d.
590,000	10	16 Oct.	10½	Alliance & Dublin 10 p. c.	10	23–24	..	4 7 6
100,000	10	,,	7½	Do. 7 p. c.	10	16½–17½	..	4 5 8
300,000	100	1 July	5	Australian (Sydney) 5 % Deb.	100	107–109	..	4 11 9
200,000	5	14 Nov.	6½	Bombay, Limited	5	6¼–7¼	..	4 9 8
40,000	5	,,	6½	Do. New	4	5–5½	..	4 14 7
380,000	Stck.	14 Aug.	12	Brentford Consolidated	100	253–258	..	4 13 0
180,000	,,	,,	9	Do. New	100	205–210	..	4 5 8
220,000	Stck.	27 Sept.	11	Brighton & Hove Original	100	227–232	..	4 14 10
933,500	Stck.	29 Aug.	5	Bristol	100	124–128	..	3 18 1
320,000	20	27 Sept.	11½	British	20	54½–55½	..	4 1 1
50,000	10	29 Aug.	11½	Bromley, Ordinary 10 p. c.	10	22½–23½	..	4 17 10
51,510	10	,,	8½	Do. 7 p. c.	10	18½–19½	..	4 7 2
328,750	10	14 Nov.	4	Buenos Ayres (New) Limited	10	8–8½	..	4 14 1
200,000	100	1 July	6	Do. 6 p. c. Deb.	100	102–104	..	5 15 5
150,000	20	11 July	8½	Cagliari, Limited	20	30–32	–1	5 3 3
550,000	Stck.	16 Oct.	13½	Commercial, Old Stock	100	320–325	..	4 3 1
165,000	,,	,,	10½	Do. New do.	100	247–252	..	4 3 4
160,762	,,	12 June	4½	Do. 4½ p. c. Deb. do.	100	143–147	..	5 1 3
800,000	Stck.	12 June	13	Continental Union, Limited.	100	278–283	..	4 11 10
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	215–220	..	4 11 10
535,000	Stck.	29 Aug.	5½	Crystal Palace Ord. 5 p. c. Stk	100	125–130	..	4 0 9
486,090	10	26 July	11	European, Limited	10	25½–26½	..	4 3 0
354,060	10	,,	11	Do. Partly paid	7½	17–18	..	4 14 3
5,646,590	Stck.	14 Aug.	12½	Gaslight & Coke, A, Ordinary	100	292–297	+2	4 5 10
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	107–112	..	3 11 5
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	284–288	..	3 9 5
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	135–140	..	3 11 5
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	200–205	..	3 13 2
1,300,000	,,	,,	7	Do. H, 7 p. c. max.	100	193–198	..	3 10 9
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	282–287	..	3 9 8
476,000	,,	,,	6	Do. K, 6 p. c. Prf.	100	167–170	..	3 10 7
1,061,150	,,	12 June	4	Do. 4 p. c. Deb. Stk.	100	137–142	+2	2 16 4
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	147–152	..	2 19 2
908,000	,,	,,	6	Do. 6 p. c. do.	100	202–207	..	2 17 11
3,800,000	Stck.	14 Nov.	12	Imperial Continental	100	233–238	–2	5 0 10
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	6–6½	..	4 12 4
560,000	100	1 Oct.	5	Met.of Melbourne, 5 p.c. Deb.	100	113–116	..	4 6 2
541,920	20	14 Nov.	5	Monte Video, Limited	20	16½–17½	–½	5 14 3
150,000	5	28 Nov.	8	Oriental, Limited	5	7½–8*	+½	5 0 0
60,000	5	12 Sept.	7	Ottoman, Limited	5	5–5½	..	6 7 3
166,870	10	14 Feb.	2	Para, Limited	10	1½–2½	..	8 0 0
420,000	100	2 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	105–110	..	5 9 1
500,000	100	4 June	6	2nd Do.	100	102–107	..	5 12 1
150,000	10	16 Oct.	7	San Paulo, Limited	10	11–12	..	5 16 8
500,000	Stck.	29 Aug.	15½	South Metropolitan, A Stock	100	370–375	..	4 2 8
1,350,000	,,	,,	12	Do. B do.	100	307–312	–1	3 16 11
308,685	,,	,,	13	Do. C do.	100	325–330	..	3 18 9
800,000	,,	11 July	5	Do. 5 p. c. Deb. Stk.	100	175–178	..	2 16 2
60,000	Stck.	12 Sept.	11½	Tottenham & Edm'nton, "A"	100	230–235	..	4 17 10
				WATER COMPANIES.				
746,021	Stck.	26 June	10	Chelsea, Ordinary	100	297–302	+2	3 6 2
1,719,514	Stck.	16 Oct.	7	East London, Ordinary	100	215–220	–3	3 3 7
654,740	,,	26 June	4½	Do. 4½ p. c. Deb. Stk.	100	157–162	..	2 15 6
700,000	50	26 June	6½†	Grand Junction	50	110–115	..	2 16 6
708,000	Stck.	29 Aug.	12	Kent	100	307–312	..	3 16 11
1,043,800	100	26 June	7½†	Lambeth, 10 p. c. max.	100	247–252	–2	2 17 8
406,200	100	,,	7½†	Do. 7½ p. c. max.	100	210–215	+2	3 7 6
330,000	Stck.	27 Sept.	4	Do. 4 p. c. Deb. Stk.	100	143–148	..	2 14 2
500,000	100	14 Aug.	12½	New River, New Shares	100	380–390	..	3 3 7
1,000,000	Stck.	26 July	4	Do. 4 p. c. Deb. Stk.	100	143–148	..	2 14 2
902,300	Stck.	12 June	4	S'thwk & V'xhall, 10 p.c. max.	100	138–143	–7	2 15 11
126,500	100	,,	4	Do. D 7½ p.c. do.	100	140–145	..	2 15 2
1,155,066	Stck.	12 June	10	West Middlesex	100	293–298	..	3 7 1

*Ex div

† Next dividend will be at this rate.

The Leeds Gas Committee and Modern Retort-House Plant.—The Gas Committee of the Leeds Corporation, having in contemplation the extension of the gas-works at Meadow Lane, are looking about with a view to finding more modern and economical gas-making appliances than they have at present in use. In May last, the Committee paid a visit to the gas-works of the Glasgow Corporation, where they saw the Arrol-Foulis system of mechanical stoking, with which they were highly pleased. But before making up their minds on the subject, they propose to visit towns where other systems of stoking have been adopted. Brentford and East Greenwich are to be visited by the Committee.

Sales of Shares.—In accordance with the announcement which appeared in our advertisement columns, Mr. M. Stainton sold by auction yesterday, at the offices of the *South Shields Gas Company*, £10,000 of the Company's new stock, sanctioned by their Act of 1886. The highest figure obtained was £213 5s. per £100; the total amount realized by the sale being nearly £21,000.——On Monday last week, Mr. Alfred Richards sold by auction, at the Mart, Tokenhouse Yard, E.C., 1500 £10 shares (7 per cent.) in the *West Ham Gas Company*. The prices ranged from £14 to £15 10s. per share; the total amount realized being £21,597 10s.——At Worksop last Wednesday, £1500 of preference stock in the *Worksop Water Company* (bearing 4½ per cent. interest) was sold at prices ranging from £113 10s. to £114 10s. per cent.

The Water Supply of Deal.—Dissatisfaction is being expressed at the water supply of Deal; and at the monthly meeting of the Town Council last Tuesday, a Committee was appointed to make preliminary inquiries and confer with the Walmer District Council with reference to the acquisition of the undertaking of the Water Company by the former authority. On the following evening, a serious fire occurred in Middle Street, at which a lady (Miss F. B. Smith) lost her life. At the inquest on Thursday, there seemed to be a desire to put blame upon the Company for inadequate service. The Company's Secretary and Manager (Mr. W. R. Hammond), however, stated that there was a constant supply under pressure up to a point so close to the scene of the fire that, if a valve had been opened, there would have been water in two minutes at full pressure. From some inexplicable reason, the Fire Brigade did not turn on the water themselves, nor did they acquaint the turncock, as they were always told to do. The jury returned a verdict of "Accidental death;" but they added the following rider: "The jury are very strongly of opinion that the Water Company should give a constant supply of water; the present arrangement being very unsatisfactory for general and household requirements, and in case of fire, the danger to life and property is very greatly increased."

The Teignmouth Gas-Works.—Some discussion took place at the meeting of the Teignmouth District Council last Tuesday respecting the financial position of the gas undertaking. Mr. F. Wheatley, in presenting the report of the Finance Committee, said he anticipated a serious deficit on the gas account next Lady Day. The total receipts to that date he estimated at £1795; while including the sum of £1405 now owing, the liabilities would be £2320. There would thus be a deficit of £525, besides which there was the cost of the coal, which would have to be purchased. Under the present arrangement, they were not able to buy to the best advantage. This increased the difficulty of the position, and something ought to be done to remedy it. They ought to raise the price of gas. The Chairman (Mr. T. W. Hutchings) said this was a matter for the Gas Committee. To this Mr. Wheatley replied that nothing was being done; and unless speedy action were taken, the price could not be increased until Midsummer. Mr. Harris, the Chairman of the Gas Committee, said that eighteen months or two years ago, when coal was dear, he was in favour of increasing the price; but the majority of members were against it. On the reading of the minutes of the Gas Committee, it transpired that the stock of coal had dwindled down to a fortnight's consumption; and the Manager recommended that a temporary supply should be obtained by rail till the next shipload arrived. Mr. G. H. Jarvis pointed out that there was a resolution on the minutes to the effect that the coal-stores should be filled when winter commenced; but instead of being full, they were now empty. He thought this was bad management. It was decided to procure a supply as recommended by the Manager.

GWYNNE & BEALE'S
PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM, LONDON." Telephone No. 65,095.

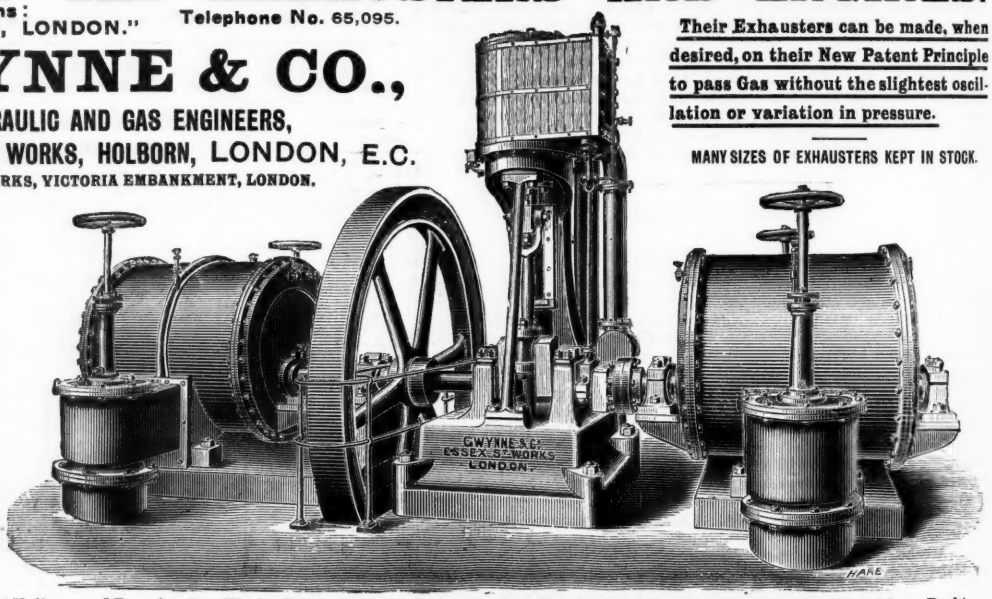
GWYNNE & CO.,

HYDRAULIC AND GAS ENGINEERS,

BROOKE STREET WORKS, HOLBORN, LONDON, E.C.

Late ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON.

They have completed Exhausters to the extent of 32,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work.



Their Exhausters can be made, when desired, on their New Patent Principle to pass Gas without the slightest oscillation or variation in pressure.

MANY SIZES OF EXHAUSTERS KEPT IN STOCK.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, PATENT RETORT-LIDS, STEAM-PUMPS for Tar, Liquor, or Water; CENTRIFUGAL PUMPS and PUMPING ENGINES, specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

Exhausting Machinery at Fulham and Bromley Gas-Works, London—each set passing 400,000 cub. ft. per hour drawing 14 miles distant from Beckton.

Catalogues and Testimonials sent on application.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS, should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.

JOHN WM. O'NEILL, Managing Director, Palmerston Buildings, Old Broad Street, London, E.C.

ANDREW STEPHENSON, AGENT. All communications re Oxide to be addressed to Palmerston Buildings.

WINKELMANN'S "VOLCANIC" CEMENT. Fire Resistance up to 4500° Fahr. In use in most Continental Gas-Works, and in more than 300 British Gas-Works

ANDREW STEPHENSON, 182, GRESHAM HOUSE, OLD BROAD STREET, LONDON, E.C.

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W. C. HOLMES & CO., Huddersfield; AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also Improved Patent Rotary Scrubber-Washers.

*** See Advertisement p. II., centre of JOURNAL.

Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

J. & J. BRADDOCK, Globe Meter Works, Oldham.

First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.

Telegraphic Address: "Braddock Oldham."

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JOHN NICHOLSON & SONS, Limited; Chemical Works, Leeds, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

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BALE & CO.'S Oxide of uniform quality. Sample and Price on application.

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PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for, Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings, at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.

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AMMONIACAL LIQUOR Wanted.
BROTHERTON AND Co., Ammonia Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

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BROTHERTON AND Co., Tar Distillers.
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TUBES and Fittings for Gas, Steam, and Water, in stock to 8 inches diameter; Iron and Steel Ascension-Pipes.
JOHN SPENCER, Globe Tube Works, WEDNESBURY; and 14, Great St. Thomas Apostle, LONDON.

HUTCHINSON BROTHERS, Gas Engineers, &c., Falcon Works, Barnsley, Makers of Wet and Dry Gas-Meters, Brass-Work, and general Gas Apparatus, Lead Saturators, Tanks, &c., Tools, and Gas-Works Sundries. (See p. 1107 last week's issue.)
Telegrams: "HUTCHINSON BROS., BARNSLEY."

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ROBERT BRUCE FITZMAURICE, 29, Great St. Helens, London, Shipping Agent to several Gas Companies and Plant Manufacturers, would be glad to UNDERTAKE LARGE or SMALL SHIPMENTS to any Port.

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JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c.
CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special Attention to Repairs.
Before placing Orders, please write for Estimate.

BACK-PRESSURE IN PURIFIERS.

THE Valve invented by Mr. Cripps for Bye-Passing any Layer of Purifying Material (referred to by the President of the Incorporated Institution of Gas Engineers in his Inaugural Address) can be obtained of the Makers: C. & W. WALKER, Midland Iron-Works, Donnington, near Newport, SALOP, and J. EVERY & SON, Phœnix Iron-Works, LEWES, to which Firms all inquiries should be addressed.

WILL you kindly place the Coloured SUPPLEMENT, sent with this Paper a fortnight ago, in your Show-Room, and oblige.
RICHMOND AND Co., LTD., Gas Apparatus Manufacturers, WARRINGTON and LONDON.

WANTED, a Situation as Gas-Fitter, and MAIN and SERVICE LAYER. Thorough knowledge of Stoves, Gas-Fires, Index Reading, &c. Six years in present Situation. Good References.
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ENGINEER and Manager of a fairly large Provincial Gas Company in the South of England can thoroughly recommend well-educated, conscientious, and energetic young man for CLERKSHIP, COLLECTORSHIP, or other suitable Appointment. Excellent Testimonials and the soundest References as to capacity and character.
Address No. 2604, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

JUNIOR Gas-Fitter wanted. No Improver.
Apply to the MANAGER, Gas-Works, ST. MARY CRAY.

GAS Stoker wanted, at once, at a sma'l Works. Constant Job. Eight-hour shifts in Winter; twelve-hour in Summer. Wages, 26s. per week, 6d. per hour overtime.
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CAMBRIDGE UNIVERSITY AND TOWN GAS-LIGHT COMPANY.

WANTED, an experienced person to take charge of the Distributory Plant of the Company. A thorough knowledge of Internal Fitting essential.
Application, in first instance, stating Age, and Remuneration required, to be addressed to the undersigned.

O. J. WEEKS,
Manager.
Gas Office: Sidney Street, Cambridge.

SINGAPORE GAS COMPANY, LIMITED.

WANTED, a fully qualified Gas En- gineer to take over the duties of MANAGER and LOCAL SECRETARY of the above Company in March next (leaving England about the 1st of February). Salary, $400 a month, with good Residence and other Allowances, including First-Class Passage for himself and wife. Three years' engagement.
Applications, stating Age (which must be under 40), Qualifications, together with not more than three recent Testimonials, should be forwarded by Wednesday, the 11th of December, to the undersigned, from whom all particulars can be obtained.
ROBERT M. CHRISTIE,
Secretary.
98, Cannon Street, E.C.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
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NEW GAS PLANT CEMENT.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
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For all Joints in connection with Oil-Gas Plant and Sulphate Plant.
For all Gas Joints.
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WALTER THOMASON and SONS, Chemical Plumbers, &c., and Makers of Lead Saturators, &c., 21, WESTON STREET, BOLTON. Repairs of every description.
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SADLER AND CO., LIMITED, MIDDLESBROUGH; ULVERSTON (BARROW); PORTSMOUTH; CARLTON; STOCKTON; 315, St. Vincent Street, GLASGOW; and 85, Water Street, NEW YORK. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: MIDDLESBROUGH. Correspondence invited.

THE Gas Committee of the Leeds Cor- poration invite OFFERS for One of HATHORN-DAVY'S PATENT STEAM-PUMPS.
The same can be seen, and further Particulars obtained, on application to Mr. G. Tooley, Manager, Gas-Works, Meadow Lane, Leeds.
Tenders, suitably endorsed, and addressed to the Chairman of the Gas Committee, Municipal Buildings, Calverley Street, will be received not later than Wednesday, the 18th of December.
R. H. TOWNSLEY,
General Superintendent.

THE Gas Committee of the Leeds Cor- poration invite OFFERS for Two Pairs of ANDERSON'S EXHAUSTERS, consisting of Four Vertical Pumps, with Cylinders 26 inches diameter, each pair worked by a 10-Horse Power Engine, and capable of passing 50,000 feet per Cylinder per hour. The Exhausters, which are in good working order, can be seen, and further Particulars obtained, on application to Mr. G. Tooley, Manager, Gas-Works, Meadow Lane, Leeds.
Tenders, suitably endorsed, and addressed to the Chairman of the Gas Committee, Municipal Buildings, Calverley Street, Leeds, will be received not later than Wednesday, the 18th of December.
R. H. TOWNSLEY,
General Superintendent.

TO TAR DISTILLERS.

THE Directors of the Shotley Bridge and Consett District Gas Company invite TENDERS for the purchase of the TAR produced at their Works for the Year 1896.
Quantity, about 60,000 gallons.
Contractor to provide Casks, and accept delivery at Consett and Blackhill Station.
Tenders to be sent to the undersigned not later than Dec. 12.
M. RICHLEY,
Secretary.

CORPORATION OF LEICESTER.

RETORTS AND FIRE-BRICKS.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of RETORTS and FIRE-BRICKS.
Specification, Quantities, and Form of Tender can be obtained from the Engineer.
Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Retorts, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Dec. 7, 1895.
The Committee do not bind themselves to accept the lowest or any tender.
ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.
Offices: Millstone Lane,
Leicester, Nov. 14, 1895

CORPORATION OF LEICESTER.

CAST-IRON PIPE CONTRACT.

THE Gas and Electric Lighting Com- mittee of the above Corporation are prepared to receive TENDERS for the supply and delivery of the necessary CAST-IRON PIPES and CONNECTIONS, from 2 inches to 24 inches in diameter, required during the Twelve Months ending the 31st of December, 1896.
Specification and Form of Tender to be obtained from the Engineer.
Tenders, addressed to Alderman Lennard, Chairman, and endorsed "Tender for Cast-Iron Pipes, &c.," to be delivered at these Offices not later than Eleven o'clock a.m., on Saturday, Dec. 7, 1895.
The Committee do not bind themselves to accept the lowest or any tender.
ALFRED COLSON, M.Inst.C.E.,
Engineer and Manager.
Offices: Millstone Lane,
Leicester, Nov. 14, 1895.

HYDRATED OXIDE OF IRON.

PREPARED from pure Iron,
Two or three times as rich as Bog Ore.
Strong action on Sulphuretted Hydrogen.
To be used alone, but will increase activity of other Oxides.
Less than half the price of Bog Ore.
Can be lent on hire.
Write for tabulated results.
READ HOLLIDAY AND SONS, LIMITED, HUDDERSFIELD.

THE Undersigned is in a position to supply, at the very lowest Prices, the most suitable kind of BENZOL for enriching Gas, made from Hardman's Patent Carbonisation Process, of which I am the Sole Patentee. On application, I would furnish Price on the most reasonable terms; giving advice how to utilize it on the most economical method.
J. HARDMAN, Manufacturing Chemist.
Milton, Staffs.

It is Worth Your While to Buy
DIRECT.
THE RELIANCE LUBRICATING OIL COMPANY will SUPPLY on APPROVAL 40-gallon Barrels "RELIANCE" NON-CORROSIVE LUBRICANTS (which, through their superiority, have the largest sale in the world)—viz., Engine, Cylinder, and Machinery Oils, 11½d.; Spindle Oil, 8½d.; Gas-Engine and Dynamo Oils, 1s. 6d. per gallon; Barrels Free and Carriage Paid. Also Solid and Liquid Lubricants for all other purposes.
RELIANCE LUBRICATING OIL COMPANY,
19 & 21, WATER LANE, GREAT TOWER STREET, LONDON, E.C.

THE Gas Committee of the Todmorden Urban District Council are prepared to receive TENDERS and DESIGNS for the complete erection of RETORT-STACK on the Inclined Principle, including all Fittings, Machinery, &c.
Specification and Particulars may be had on application to the undersigned.
Sealed tenders, endorsed "Tender for Retort-Stack, &c.," to be sent in addressed to the Chairman of the Gas Committee, Town Hall, Todmorden, not later than Twelve Noon on Friday, the 20th of December, 1895.
By order,
GEORGE E. SAVILLE,
Engineer and Manager.
Gas-Works, Todmorden,
Nov. 28, 1895.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

RETORTS AND FIRE-BRICKS.

TENDERS are invited for the supply of RETORTS and FIRE-BRICKS required at their various Works.
Full Particulars and Forms of Tender may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.
Sealed tenders, endorsed "Fire-Clay Goods," addressed to the Chairman of the Gas Committee, to be sent to my Office not later than Five p.m., on Thursday, Dec. 19, 1895.
By order,
SAML. BROWN,
Town Clerk.
Town Hall, Salford,
Nov. 25, 1895.

ROCHDALE CORPORATION.

TO IRONFOUNDERS AND OTHERS.

THE Gas Committee of the above Cor- poration invite TENDERS for the supply of such quantities of CAST-IRON PIPES and SPECIALS of various sizes as they may require during a period of Twelve Months from the 1st of January, 1896.
Forms of Tender and any further Particulars may be obtained on application to Mr. T. Banbury Ball, the Manager at the Gas-Works.
Tenders, endorsed "Pipes," stating price per ton for each size of Pipes and Specials, delivered at Rochdale Station, must be sent in to me not later than Noon, on Wednesday, the 11th of December, 1895.
Contractors who intend to sub-let part of their contracts must forward with their original tender a list of the Names of their Sub-Contractors.
By order,
JAMES LEACH,
Deputy Town Clerk.
Town Hall, Rochdale,
Nov. 30, 1895.

ROCHDALE CORPORATION.

TO RETORT MAKERS AND OTHERS.

THE Gas Committee of the above Cor- poration invite TENDERS for the supply of such quantities of RETORTS and other FIRE-CLAY GOODS as may be required during the Year ending the 31st of December, 1896.
Forms of Tender and any further Information may be obtained on application to Mr. T. Banbury Ball, the Manager at the Gas-Works.
Tenders, endorsed "Fire-Clay Goods," must be sent to me not later than Noon, on Wednesday, the 11th of December, 1895.
Contractors who intend to sub-let part of their contracts must forward with their original tenders a list of the Names of their Sub-Contractors.
By order,
JAMES LEACH,
Deputy Town Clerk.
Town Hall, Rochdale,
Nov. 30, 1895.

BOROUGH OF HEYWOOD.

THE Gas Committee invite Tenders for the supply of FIRE-CLAY GOODS.

Specifications and Form of Tender may be obtained upon application to Mr. W. Whatmough, Gas Manager.

Contractors tendering for this work must pay their workpeople at least the Standard or Trade Union rate of Wages, and observe the Trade Conditions which attach to the various kinds of work for which the tender is sent in.

Tenders, endorsed "Fire-Clay Goods," to be sent to me not later than Tuesday, the 17th day of December, 1895.

By order,
A. B. PILLING,
Town Clerk.

Municipal Buildings, Heywood,
Nov. 13, 1895.

CARDIFF GASLIGHT AND COKE COMPANY.
(INCORPORATED MAY 5, 1837.)

THE Directors of the Cardiff Gaslight and Coke Company Hereby Give Notice that they are prepared to receive not later than Ten a.m., Friday, the 13th of December, 1895, sealed TENDERS for

£15,000 "D" STOCK,

bearing a Maximum Dividend of 5 per cent. per annum, in pursuance of the powers of the Cardiff Gas Act, 1887.

Particulars and Conditions of Tender may be obtained on application to the undersigned.

By order,
GEORGE CLARRY,
Secretary.

Gas Offices, Cardiff,
Nov. 13, 1895.

SOUTHAMPTON GASLIGHT & COKE COMPANY.

ISSUE OF 5 PER CENT. DEBENTURE STOCK.
SALE BY TENDER.
MINIMUM PRICE, £150 PER CENT.

THE Directors invite Tenders for £5000 of DEBENTURE STOCK, authorized to be raised under the Southampton Gas Act, 1876, which will bear a fixed and Perpetual Preferential Rate of Interest of Five Pounds per cent. per annum, payable Half Yearly (subject to Income-Tax).

Allotments to the highest bidders.

Tenders must be delivered on or before Saturday, the 14th of December, 1895.

Forms of Tender, with Particulars and Conditions, may be obtained on application, from the Secretary, at the Company's Offices, Ogle Road, Southampton, or from the Company's Bankers, Messrs. Grant and Maddison's Union Banking Company, Limited, Southampton, or from Messrs. Lloyd's Bank, Limited, Lombard Street, London.

By order of the Directors,
C. CROWTHER SMITH,
Secretary.

Southampton,
Nov. 20, 1895.

BROMLEY GAS CONSUMERS' COMPANY.

SALE BY AUCTION OF 399 ORDINARY SHARES OF £10 EACH.

THE Directors give Notice that they have instructed Messrs. Baxter, Payne, and Lepper to SELL BY AUCTION, at the Bell Hotel, Bromley, Kent, on Thursday, the 12th of December, 1895, at Eight o'clock p.m. precisely, 399 ORDINARY SHARES of £10 each, in the Bromley Gas Consumers' Company, in lots of Five and Ten Shares each, and one lot of Nine Shares.

The Dividend paid upon this class of Shares for the past four years has been at the rate of 8½ per cent. per annum.

Particulars and Conditions of Sale may be obtained of the SECRETARY of the Company; Messrs. WILLETT AND LATTER, Solicitors, Market Square, Bromley, KENT; and of the AUCTIONEERS, Market Square, Bromley, KENT.

By order,
HENRY WILLIAM AMOS,
Secretary.

Bromley, Kent,
Nov. 20, 1895.

THE GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the TRANSFER BOOKS of this Company, so far as they relate to DEBENTURE STOCKS and BONDS, WILL BE CLOSED at Four o'clock, p.m., on Tuesday, the 10th prox., for the Half Year ending on the 31st prox., and will be RE-OPENED on the Morning of Wednesday, the 11th prox.

The Interest for the Half Year will be payable, on the 1st of January next, to the Proprietors registered on the closing of the Books.

By order,
JOHN WILLIAM FIELD,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Nov. 29, 1895.

EAST LONDON WATER-WORKS COMPANY.

ISSUE OF £125,000 THREE PER CENT. DEBENTURE STOCK.
MINIMUM PRICE, PAR.

NOTICE is Hereby Given, that the Directors are prepared to receive TENDERS for the above Issue (being the second portion of the £500,000 Debenture Stock, created under the East London Water-Works Company's Act of 1894), bearing Interest at 3 per cent. per annum less Income-Tax, and Redeemable after the expiration of 25 Years from the date of issue, subject to Six Months' Notice being given by the Company.

Minimum price, par.

Tenders must be delivered at the Company's Office, St. Helen's Place, Bishopsgate, E.C., not later than Eleven a.m., on Thursday, the 12th day of December ensuing.

Particulars and Conditions, together with Form of Tender, may be obtained at the said Offices, or will be forwarded on application.

By order of the Court of Directors,
I. A. CROOKENDEN,
Secretary.

St. Helen's Place, Bishopsgate, E.C.,
Nov. 13, 1895.

BY ORDER OF THE DIRECTORS OF THE BARNET DISTRICT GAS & WATER COMPANY.

£5820 of "D" Gas Capital Stock, being a further portion of the Gas Stock authorized to be raised by the Barnet District Gas and Water Act of 1883. The Maximum Dividend is 7 per cent.; the last Dividend paid on the same class of Stock having been at the rate of £6 6s. per cent. per annum.

MR. ALFRED RICHARDS will Sell the above BY AUCTION at the Mart, E.C., on Thursday, Dec. 5, at Two precisely, in lots.

Particulars at the place of Sale; of ALFRED LASS, Esq., Secretary of the Company, 30, GRACECHURCH STREET, E.C.; of C. A. BANNISTER, Esq., Solicitor, 70, BASINGHALL STREET, E.C.; and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

BY EDWIN FOX & BOUSFIELD.
AT THE AUCTION MART.
TO-MORROW, WEDNESDAY, DEC. 4, AT TWO.

STOCKS AND SHARES in Established Undertakings — viz., Epsom Grand Stand Association—80 New Thirds Shares (£6 13s. 4d.); Dividend 17½ per cent. Sandown Park—80 £10 Shares; Dividend 7 per cent. Langham Hotel—40 £10 Shares (£6 paid); Dividend 10 per cent. Hayward's Heath Gas Company—150 £10 Shares, ranking for Standard Dividends of 7 per cent., but at present price of Gas is entitled to over 8 per cent. Cape Town and District Gas Company—5 £50 6 per cent. Second Mortgage Debentures; Ordinary Share Dividend 6 per cent. Harrod's Stores—50 £5 Preference 5 per cent. Shares; Ordinary Share Dividend 17 per cent. "Ye Mecca," Limited—35 £5 Shares; Dividend for last five years 15 per cent. per annum. Harvey Steel Company of Great Britain—40 £10 Shares; Dividend 31 per cent. Empire Palace—£1 Shares (15s. paid). Archibald Arrol and Sons—100 £10 5¼ per cent. Preference Shares. Incorporated Proprietary—20 £25 Shares. Lockhart's, Limited—200 £1 5½ per cent. Preference Shares. London Exhibitions—100 £10 Shares. And in other Companies.

Particulars at the MART, and of Messrs. EDWIN FOX AND BOUSFIELD, No. 99, Gresham Street, BANK, E.C.

THORNLEY GAS COALS

WORKED BY THE

WEARDALE IRON & COAL Co., Ld.

OUT OF THEIR

THORNLEY AND WHEATLEY HILL COLLIERIES.

Analysis made by

Messrs. J. & H. S. PATTINSON, *May 28, 1895.*

Yield of Gas per Ton . .	10,500 Cub. Ft.
Illuminating Power . .	16·9 Candles.
Coke (of good quality) . .	67·5 per Cent.
Sulphur	0·58 ,,
Ash	2·73 ,,

For Price, &c., apply to the

WEARDALE IRON & COAL Co., Ld.

QUAYSIDE, NEWCASTLE-ON-TYNE.

NOTICE.

Whereas it has come to the knowledge of the INCANDESCENT GAS LIGHT COMPANY, Limited, of Palmer Street, Westminster, that a Company called the "Meteor" Incandescent Lighting Company, Limited, is selling and offering for sale a form of Incandescent Gas Light known as the "Meteor" Incandescent Gas Light.

This is to Give Notice that the Incandescent Gas Light Company, Limited, will commence actions for infringement of their Patents against all persons found dealing in any manner with the said "Meteor" Incandescent Gas Light which is constructed in infringement of the Patents of the Incandescent Gas Light Company, Limited. The validity of these Patents has been established, and a certificate to that effect has been granted, by the Hon. Mr. Justice Romer.

FAITHFULL & OWEN,
11, Victoria Street, S.W.
Solicitors to the Incandescent Gas Light Company.

NOTICE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, Hereby Give Notice, that a Firm of F. J. Putz & Co., 16 and 17, Great St. Helen's, London, are advertising for sale Incandescent Gas-Light Apparatus called the "Champion" Incandescent Gas-Burner, and are stating in their circular that such Apparatus may be legally sold throughout the United Kingdom without Infringement of any existing Patent.

This is to Give Notice to the Public and the Trade that Actions for Infringement of Patent and for an Injunction will be immediately commenced by the Incandescent Gas-Light Company, Limited, against any persons using or selling such Apparatus.

The validity of the Company's Patents has already been certified by Mr. Justice Romer; and Solicitor and Client costs will be enforced in all cases.

FAITHFULL & OWEN,
11, Victoria Street, S.W.
Solicitors for the Incandescent Gas-Light Company, Limited.

NOTICE.

THE INCANDESCENT GAS-LIGHT COMPANY, LIMITED, Hereby Give Notice, that they only supply their Mantles subject to the following express Conditions, which are printed and pasted on each box:—

> "The Incandescent Gas-Light Company, Limited, in supplying the Mantle contained in this box, grant a Limited License to the purchaser to sell or use the same on the express condition that neither the purchaser nor any other person into whose hands the same may come shall use or sell the said Mantle except in connection, or for use, with Burners sold or supplied by the Company; any other sale or use will amount to Infringement of the Company's Patents. The Company supply Mantles for the purpose of renewals at the nominal price of 1s. 3d., subject to the Conditions and Limitations above set forth."

In the case of *The Incandescent Gas-Light Company, Limited v. Cantelo,* Mr. Justice Wills upheld the Validity of these Conditions and Limited License; and, in the course of his Judgment, said:—

> The patentee has the sole right of using and selling the articles; and he may prevent anybody from dealing with them at all. Inasmuch as he has the right to prevent people from using them or dealing in them at all, he has the right to do the lesser thing—that is to say, to impose his own conditions. It does not matter how unreasonable or how absurd the conditions are. It does not matter what they are if he says at the time when the purchaser proposes to buy, or the person proposes to take a license: 'Mind I only give you this license on this condition;' and the purchaser is free to leave it or take it as he likes. If he takes it, he must be bound by the condition."

In the case of *The Incandescent Gas-Light Company v. Hirschfeld and Others,* the Honourable Mr. Justice Romer certified that the Validity of the Plaintiffs' Patents was established. Infringers in future will be liable to costs as between Solicitor and Client.

(Signed) FAITHFULL & OWEN,
Solicitors for the Incandescent Gas-Light Company, Limited.

Price 6s., Cloth Bound,

THE CHEMISTRY OF ILLUMINATING GAS.

By N. H. HUMPHRYS, Assoc. M.Inst.C.E., F.C.S.

LONDON: Walter King, 11, Bolt Court, Fleet St., E.C.

BOLDON GAS COALS.

Worked by THE HARTON COAL CO., LTD.

Output about 3000 tons per day.

ANALYSIS—

Yield of Gas per ton . .	10,500	Cubic Feet.
Illuminating Power . .	16·9	Candles.
Coke	66·7	Coke.
Sulphur	0·86	Sulphur.
Ash	2·04	Ash.

Boldon Gas Coals are supplied under contract to

The Gaslight and Coke Company, South Metropolitan Gas Company, Commercial Gas Company, Imperial Continental Gas Association, European Gas Company, L'Union des Gaz (the Continental Union Gas Company), Crystal Palace District Gas Company, Danish Gas Company, Bombay Gas Company, San Paulo Gas Company, Alliance and Dublin Consumers' Gas Company, Ipswich Gaslight Company, Newcastle Gas Company, Sunderland Gas Company, South Shields Gas Company, and to many other Companies at Home and Abroad.

For prices, &c., apply to the

HARTON COAL COMPANY, LIMITED,

Newcastle-on-Tyne.

W. H. PARKINSON, FITTER.

Awarded HIGHEST MEDAL and DIPLOMA at the Newcastle-on-Tyne Royal Mining and Industrial Exhibition, 1887,

for

CANNEL & COAL.

TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

SOUTH PELAW MAIN GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	73·1 per cent.

For Prices and complete Analysis, apply to

THOS. W. DANCE & SONS, COAL OWNERS, NEWCASTLE-ON-TYNE;

OR

E. FOSTER & CO., 21, JOHN STREET, ADELPHI, LONDON, W.C.

HOLMSIDE GAS COALS.

PRESENT DAILY PRODUCE OVER 4000 TONS.

LATEST ANALYSIS :—

Yield of Gas Per Ton . . 11,205 Cubic Feet.
Illuminating Power, $16\frac{7}{10}$ Stand. Sperm. Candl.
Coke (of good & pure quality) $13\frac{3}{4}$ Cwt. Per Ton.
Sulphur . . . . A little over 1 Per Cent.
Ash . . . . . Under 1 Per Cent.
Tar . . . . . 163 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor 103 Lbs. (Avoir.) Per Ton.

HOLMSIDE GAS COALS are supplied to the largest Gas Companies in England and on the European Continent; London alone consuming about half the produce.

SOUTH MOOR PELTON GAS COALS.

PRESENT DAILY PRODUCE AVAILABLE 2500 TONS.

RESULTS OF DIFFERENT ANALYSES :—

Yield of Gas Per Ton . . 10,500 Cubic Feet.
Illuminating Power . 17 Stand. Sperm Candl.
Coke (of excellent quality) . $13\frac{1}{2}$ Cwt. Per Ton.
Sulphur . . . . . 1·13 Per Cent.
Ash. . . . . 1·34 Per Cent.
Tar. . . . . 180 Lbs. (Avoir.) Per Ton.
Ammoniacal Liquor $94\frac{1}{2}$ Lbs. (Avoir.) Per Ton.

The HOLMSIDE and SOUTH MOOR COALFIELD possesses *a very great quantity of the best Coal;* and, whilst other Coal-Fields are becoming exhausted, this one is only being opened out, so that *the quality* of both the HOLMSIDE COALS, and the SOUTH MOOR COALS *may be relied upon for all practical purposes.*

These Coals may be bought through the Principal Merchants in England, or direct from

MR. MARK ARCHER,

HOLMSIDE AND SOUTH MOOR OFFICES,

NEWCASTLE-UPON-TYNE.

TAR AND LIQUOR PURCHASED.

JOHN CLARKSON MAJOR,

(Established 1851,)

Tar Distiller and Manufacturing Chemist,

WOLVERHAMPTON.

THOMAS TURTON AND SONS, LIMITED,

SHEAF WORKS, SHEFFIELD,

MANUFACTURERS OF

FILES OF BEST QUALITY

FOR ENGINEERS.

STEEL OF ALL DESCRIPTIONS.

SCREW STOCKS, TAPS AND DIES, SPANNERS, RATCHET BRACES, LIFTING JACKS ANVILS, VICES, AND ENGINEERS' TOOLS GENERALLY.

LONDON OFFICE :

90, CANNON STREET, E.C.

KENT'S THICK GAS COAL

RAISED AT

The Wharncliffe Woodmoor Colliery,

BARNSLEY.

Yield of Gas, nearly 12,000 *Cubic Feet per ton of Coal; and Illuminating Power nearly* $17\frac{1}{2}$ *Candles.*

The following is a complete ANALYSIS made by Mr. R. O. PATERSON, C.E., Gas-Works, Cheltenham :—

Specific Gravity (Water 1). .	1·276
Weight of One Cubic Foot. .	79·700 lbs.

PROXIMATE ANALYSIS.

Moisture in Coal	2·68 per cent.
Volatile Matter.	35·60 ,,
Fixed Carbon	58·80 ,,
Sulphur	0·96 ,,
Ash.	1·96 ,,

COMMERCIAL ANALYSIS.

Gas per Ton of Coal	11,760 cub. feet.
Gas per Cubic Foot of Coal .	418 ,,
Illuminating Power	17·44 candles.
Value of One Cubic Foot in Sperm	418 grains.
Value per Ton of Coal in Sperm	703 lbs.
Coke per Ton of Coal . . .	1367 ,,
Coke	61·05 per cent.
Ash in Coke	3·21 ,,
Sulphur Eliminated with Volatile Products per Ton of Coal	9·4 lbs.
Sulphur in Coke per Ton of Coal	12 ,,
Ammoniacal Liquor per Ton of Coal	19·7 galls.
Tar per Ton of Coal	12·2 ,,

R. O. PATERSON, C.E.

Gas-Works, Cheltenham, 8th August, 1894.

For Price, &c., apply to the

Wharncliffe Woodmoor Colliery Co LIMITED,

BARNSLEY;

Or to **Mr. W. H. HARVEY,**

17, Old Queen Street, Westminster, S.W.

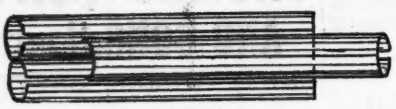
TROTTER, HAINES, & CORBETT,
Brettell's Estate
FIRE-CLAY & BRICK WORKS,
STOURBRIDGE.

Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
Proprietors of
BEST GLASSHOUSE POT & CRUCIBLE CLAY.
Shipments Promptly and Carefully Executed.

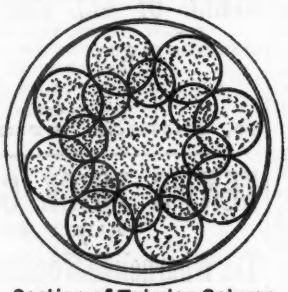
London Office: R. Cull, 31, Old Broad St., E.C.

HUNTER'S
OXIDE OF IRON.
James Hunter, Miner, and Shipper of
NATURAL IRISH BOG ORE.
This Estate yields the finest and most uniform quality in Ireland; and the quality is guaranteed.
Samples and Prices on application.
5, PRINCES STREET, PORT GLASGOW.
Telegrams: "Hunter, Port Glasgow."
Established 1872.

NEWBATTLE CANNEL.
Highest Results in Gas, & Excellent Coke.
QUOTATIONS ON APPLICATION TO
THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.



INTERLOCKED TUBING
PEASE'S PATENT.



Section of Tubular Column.

These Columns are made in a great variety of Designs, and are very Strong, Handsome, and Cheap.

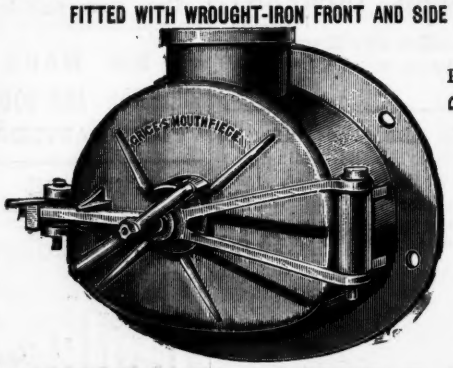
FLOORS ON THIS CONSTRUCTION COMBINE GREAT STRENGTH, WITH A LOW COST, AND DO NOT NEED PLASTERING ON THE UNDER SIDE.

For Particulars regarding these and many other Tubular Structures, apply to

Pease's Tubular Construction Syndicate, Ld.
STOCKTON-ON-TEES.

PETTIGREW'S PATENT
Sulphate of Ammonia Plant
ON THE CONTINUOUS SYSTEM
Is the newest in the Market, and is the outcome of practical experience in Sulphate Making.
Old Systems easily and cheaply converted.
ANY SIZE ERECTED COMPLETE AT HOME OR ABROAD.
Write for Particulars, Testimonials, and References to
GEO. PETTIGREW & Co.,
GAS AND CHEMICAL ENGINEERS,
MIDDLESBROUGH-ON-TEES.

GRICE'S SELF-SEALING MOUTHPIECE,
FITTED WITH WROUGHT-IRON FRONT AND SIDE LEVERS.



Patterns for Oval, D, and Rounds, or all sized Retorts.

Catalogue and Price on application.

WILLIAM GRICE & SONS,
FAZELEY STREET WORKS, BIRMINGHAM.

PHILADELPHIA EXHIBITION, 1876.
ALSO SILVER MEDAL, PARIS.
The Highest Award for Gas-Retorts and other Goods in Fire-Clay has been awarded to KING BROTHERS for their Goods made from their renowned Stourbridge Fire-Clay.

KING BROTHERS,

Proprietors of
STOURBRIDGE CLAYS,
Manufacturers of
Fire-Bricks, Tank Blocks, Glass-House Bricks and Pots, Gas-Retorts, Crucibles in Clay and Plumbago, Gas-Oven Bricks, Bricks for Regenerator Furnaces and Hot-Air Stoves.
STOURBRIDGE, ENGLAND.
CRUCIBLE MANUFACTORY, 46, PENN STREET, CURZON STREET, BIRMINGHAM.
N.B.—Gas, Blast-Furnace, and Glass-House Bricks and Glass-House Pots always in Stock, or made on the Shortest Notice.

ARROL-FOULIS

PATENT AUTOMATIC MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS

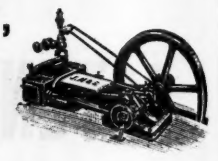
SIR WILLIAM ARROL & CO., Ltd., Sole Makers,

GLASGOW.

Plans and Estimates furnished on application.

The above engraving shows the interior of a Retort-House at the Tradeston Gas-Works, Glasgow, where the Machines have been at work since the beginning of 1893, drawing and charging **960 Retorts every 24 hours. 79 Drawing-Machines and 52 Charging-Machines are at work, or in course of construction.**

JAMES MILNE & SON, LTD.,



GAS ENGINEERS,

MILTON HOUSE WORKS, EDINBURGH.

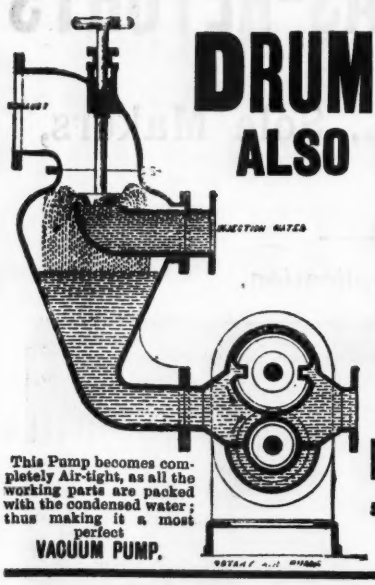
LONDON. — GLASGOW. — LEEDS.

"The Force of the Piston Pump with the Capacity of the Centrifugal combined."

JOHNSON'S PATENT

DRUM PUMP AND EXHAUSTER

ALSO VACUUM PUMP AND CONDENSER.



This Pump becomes completely Air-tight, as all the working parts are packed with the condensed water; thus making it a most perfect VACUUM PUMP.

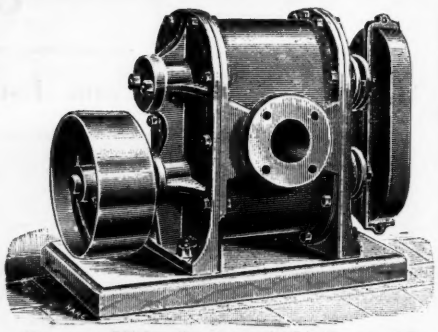
No Priming Valves or Frictional Working Parts.

The Pump of the future for quickly and economically moving large Bodies of Water, Semi-fluid, &c.

DRUM ENGINEERING Co.

55, ATHOL ROAD,

BRADFORD.



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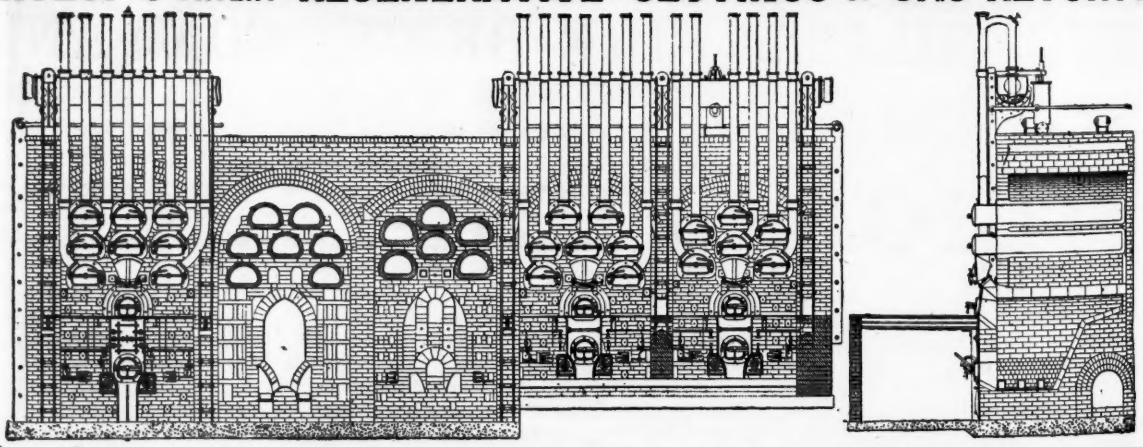
HISLOP'S PATENT REGENERATIVE SETTINGS OF GAS-RETORTS.



THESE SETTINGS ARE POSITIVELY UNRIVALLED IN PRODUCTIVE CAPACITY, DURABILITY, AND SIMPLICITY OF MANAGEMENT. RETORTS OF ORDINARY DIMENSIONS CARBONIZING FROM 18 TO 24 CWT. OF ENGLISH AND 21 TO 26 CWT. OF SCOTCH COAL PER 24 HOURS, DEPENDING UPON THE NATURE OF THE COAL, AND PRODUCING UP TO FULLY 13,000 CUBIC FEET PER MOUTHPIECE IN THE SAME TIME, AND WITH THE SMALLEST EXPENDITURE OF FUEL ATTAINABLE, AND RETURNING IN PROFIT THE ENTIRE COST OF ERECTION WITHIN TWELVE TO EIGHTEEN MONTHS; AND THUS REDUCING TO INSIGNIFICANCE THE INCREASED COST OF THESE SETTINGS OVER THE COMMON OR GENERATOR FURNACE SYSTEMS.

THESE SETTINGS ARE EXTENSIVELY ADOPTED, AND ARE ERECTED UPON THE SHALLOW AND STAGE FLOOR PLANS. THEY ARE ADAPTED TO ANY EXISTING ARRANGEMENTS, AND PERFECT SATISFACTION GUARANTEED. THE COMPOSITION OF FIRE-RESISTING AND OTHER SPECIAL FIRE-CLAY MATERIALS FURNISHED IS OF THE HIGHEST ORDER; AND THE SYSTEM AS A WHOLE, AS NOW PERFECTED, IS THE RESULT OF LONG EXPERIENCE AND CAREFUL STUDY OF THE PRINCIPLES OF GASEOUS FIRING.

Drawings and Tenders are furnished for the complete erection of Benches, including Retort and Bench Mounting of the most modern and approved description; or existing Ovens fitted up with the Patentee's arrangements.

Full Particulars may be had on application to the Patentee's Agents: **Messrs. JONAS DRAKE AND SON**, Retort Setters and General Carbonizing Engineers, Ovenden, Halifax, Yorkshire, Sole Agents for England, Wales, and Foreign Countries; **C. M. HAMILTON**, Retort Setter and Contractor, 5, Stuart Street, Shawlands, Glasgow, Agent for Scotland and Ireland; and to the Principal Agent, **R. F. HISLOP** (Son of Patentee), General Constructing and Carbonizing Engineer, Gas-Works, Paisley, N.B.

HISLOP'S PATENT HYDRAULIC MAIN SEAL-REGULATING AND TAR-EXTRACTING VALVE is a *Sine qua non* TO THE SATISFACTORY WORKING OF THE HYDRAULIC MAIN UNDER THE REGENERATIVE AS WELL AS OTHER SYSTEMS OF RETORTS. BEING LARGELY ADOPTED AND AFFORDING THE HIGHEST SATISFACTION.

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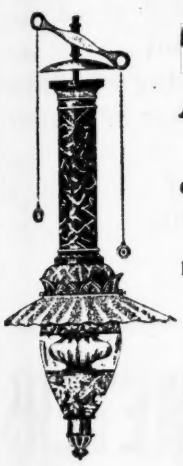

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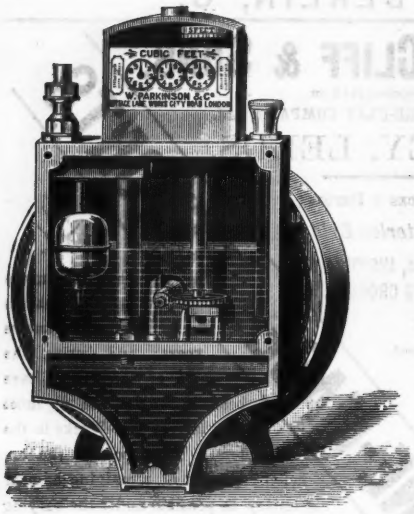

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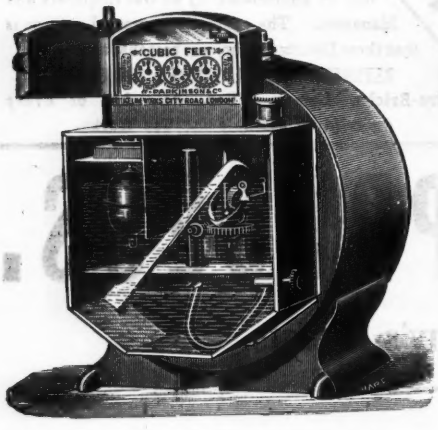

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[See also Advt. p. 1128.

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